SR Mini HG SYSTEM

Power Supply/CPU Module

H-PCP-J

Instruction Manual

RKC® RKC INSTRUMENT INC. IMS01J02-E1

- Modbus is a registered trademark of Schneider Electric.
- The name of each programmable controller (PLC) means the products of each manufacturer.
- Company names and product names used in this manual are the trademarks or registered trademarks of the respective companies.

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Thank you for purchasing this RKC instrument. In order to achieve maximum performance and ensure proper operation of your new instrument, carefully read all the instructions in this manual. Please place this manual in a convenient location for easy reference.

SYMBOLS

WARNING : This mark indicates precautions that must be taken if there is danger of electric shock, fire, etc., which could result in loss of life or injury.

CAUTION : This mark indicates that if these precautions and operating procedures are not taken, damage to the instrument may result.

: This mark indicates that all precautions should be taken for safe usage.

: This mark indicates important information on installation, handling and operating procedures.

: This mark indicates supplemental information on installation, handling and operating procedures.

: This mark indicates where additional information may be located.

⚠ WARNING

- An external protection device must be installed if failure of this instrument could result in damage to the instrument, equipment or injury to personnel.
- All wiring must be completed before power is turned on to prevent electric shock, fire or damage to instrument and equipment.
- This instrument must be used in accordance with the specifications to prevent fire or damage to instrument and equipment.
- This instrument is not intended for use in locations subject to flammable or explosive gases.
- Do not touch high-voltage connections such as power supply terminals, etc. to avoid electric shock.
- RKC is not responsible if this instrument is repaired, modified or disassembled by other than factory-approved personnel. Malfunction can occur and warranty is void under these conditions.

CAUTION

- This is a Class A instrument. In a domestic environment, this instrument may cause radio interference, in which case the user may be required to take adequate measures.
- This instrument is protected from electric shock by reinforced insulation. Provide reinforced insulation between the wire for the input signal and the wires for instrument power supply, source of power and loads.
- Be sure to provide an appropriate surge control circuit respectively for the following:
  - If input/output or signal lines within the building are longer than 30 meters.
  - If input/output or signal lines leave the building, regardless the length.
- This instrument is designed for installation in an enclosed instrumentation panel. All high-voltage connections such as power supply terminals must be enclosed in the instrumentation panel to avoid electric shock by operating personnel.
- All precautions described in this manual should be taken to avoid damage to the instrument or equipment.
- All wiring must be in accordance with local codes and regulations.
- All wiring must be completed before power is turned on to prevent electric shock, instrument failure, or incorrect action.
  The power must be turned off before repairing work for input break and output failure including replacement of sensor, contactor or SSR, and all wiring must be completed before power is turned on again.
- To prevent instrument damage or failure, protect the power line and the input/output lines from high currents with a protection device such as fuse, circuit breaker, etc.
- Prevent metal fragments or lead wire scraps from falling inside instrument case to avoid electric shock, fire or malfunction.
- Tighten each terminal screw to the specified torque found in the manual to avoid electric shock, fire or malfunction.
- For proper operation of this instrument, provide adequate ventilation for heat dispensation.
- Do not connect wires to unused terminals as this will interfere with proper operation of the instrument.
- Turn off the power supply before cleaning the instrument.
- Do not use a volatile solvent such as paint thinner to clean the instrument. Deformation or discoloration will occur. Use a soft, dry cloth to remove stains from the instrument.
- To avoid damage to instrument display, do not rub with an abrasive material or push front panel with a hard object.
- Do not connect modular connectors to telephone line.

NOTICE

- This manual assumes that the reader has a fundamental knowledge of the principles of electricity, process control, computer technology and communications.
- The figures, diagrams and numeric values used in this manual are only for purpose of illustration.
- RKC is not responsible for any damage or injury that is caused as a result of using this instrument, instrument failure or indirect damage.
- RKC is not responsible for any damage and/or injury resulting from the use of instruments made by imitating this instrument.
- Periodic maintenance is required for safe and proper operation of this instrument. Some components have a limited service life, or characteristics that change over time.
- Every effort has been made to ensure accuracy of all information contained herein. RKC makes no warranty expressed or implied, with respect to the accuracy of the information. The information in this manual is subject to change without prior notice.
- No portion of this document may be reprinted, modified, copied, transmitted, digitized, stored, processed or retrieved through any mechanical, electronic, optical or other means without prior written approval from RKC.

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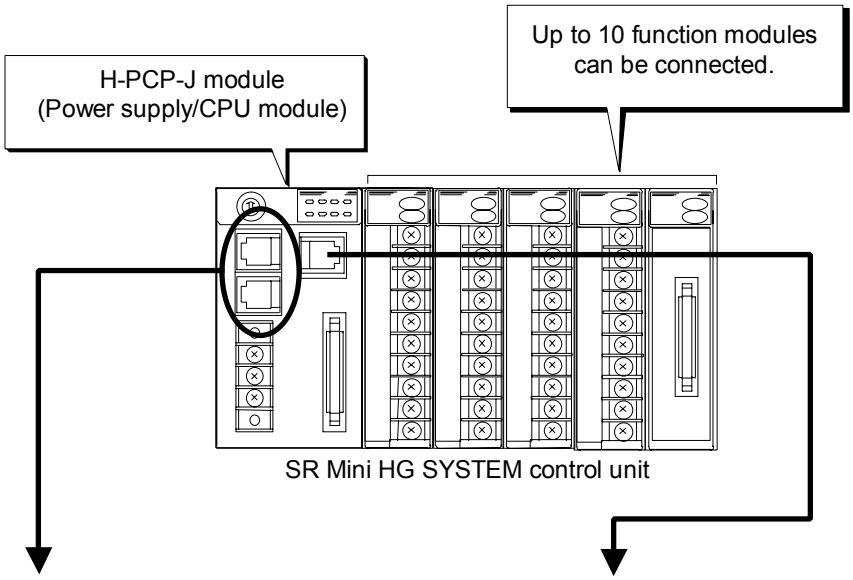
MEMO

1. OUTLINE

This manual describes the specifications, mounting, wiring and communication of the H-PCP-J module.

1.1 Features

H-PCP-J module (Power supply/CPU module) is made up of the CPU section and the power supply section for the SR Mini HG SYSTEM control unit. H-PCP-J module includes two kinds of communication port, and protocol of each port can be changed.



COM.PORT1/COM.PORT2

Interface: RS-422A
RS-485
Protocol: RKC communication protocol
Modbus protocol
The protocol corresponding to each PLC *
(Any can be selected with switch)
Connected equipment:
Host computer
Touch panel
Operation panel
PLC

COM.PORT3

Interface: RS-232C
RS-422A
RS-485
Protocol: RKC communication protocol
Modbus protocol
(Any can be selected with switch)
Connected equipment:
Host computer
Touch panel
Operation panel

* Usable programmable controller (PLC)

- MELSEC series (AnA/QnA, Q, A and FX series) manufactured by Mitsubishi Electric Corporation
- SYSMAC series manufactured by OMRON Corporation
- JW50H/70H/100H and JW30H manufactured by Sharp Corporation
- MASTER-K series and GLOFA-GM series manufactured by LG Industrial Systems

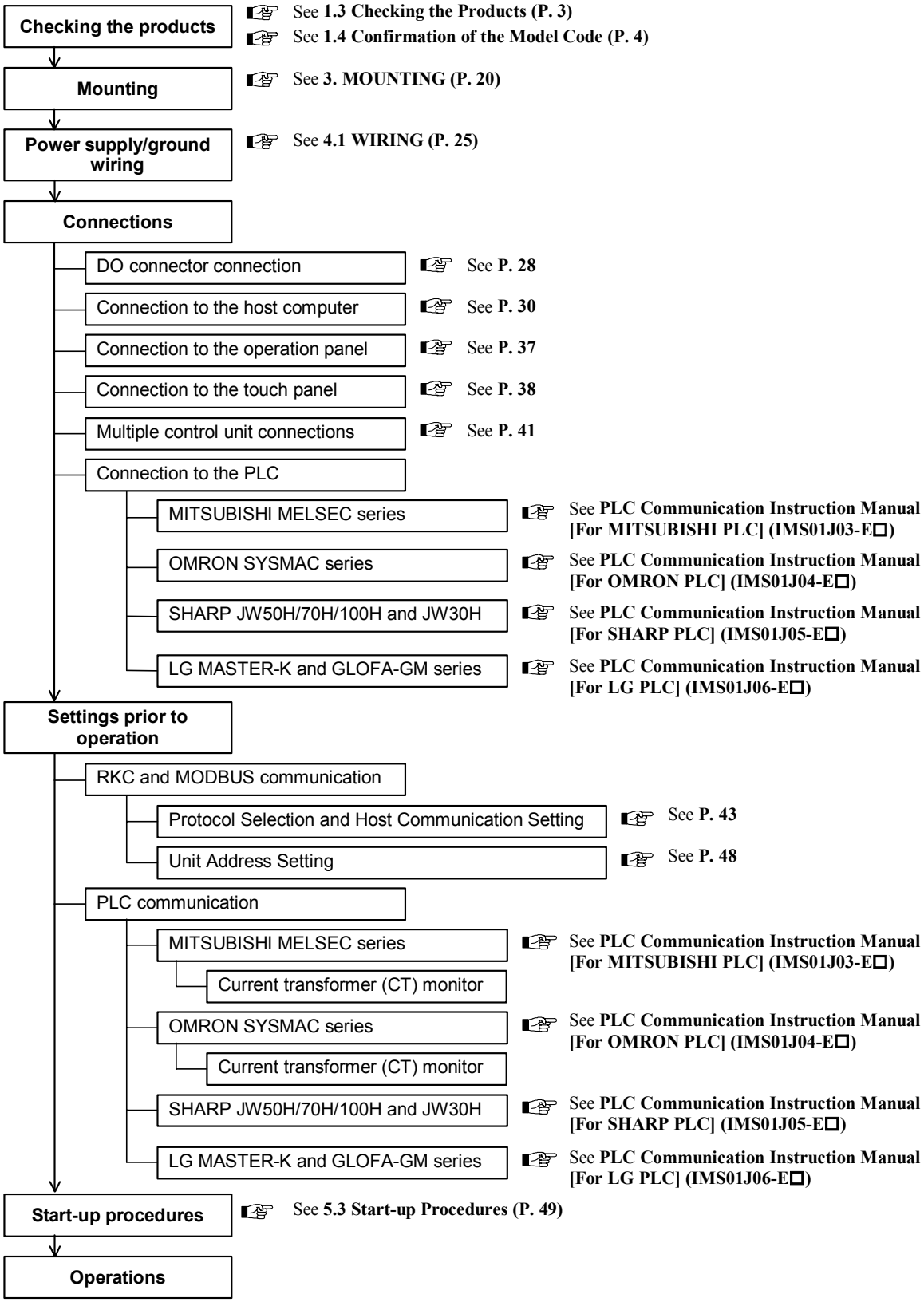
☞ For programmable controller (PLC) communication, see usage PLC instruction manual and following PLC Communication Instruction Manual.

- **PLC Communication Instruction Manual [For MITSUBISHI PLC] (IMS01J03-E☐)**
- **PLC Communication Instruction Manual [For OMRON PLC] (IMS01J04-E☐)**
- **PLC Communication Instruction Manual [For SHARP PLC] (IMS01J05-E☐)**
- **PLC Communication Instruction Manual [For LG PLC] (IMS01J06-E☐)**

📖 COM.PORT1 and COM.PORT2 become the same communication specification.

1.2 Handling Procedures

Conduct handling according to the procedure described below.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Mounting
☞ See 3. MOUNTING (P. 20)
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Connection to the PLC
MITSUBISHI MELSEC series
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SHARP JW50H/70H/100H and JW30H
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OMRON SYSMAC series
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Current transformer (CT) monitor
SHARP JW50H/70H/100H and JW30H
☞ See PLC Communication Instruction Manual [For SHARP PLC] (IMS01J05-E□)
LG MASTER-K and GLOFA-GM series
☞ See PLC Communication Instruction Manual [For LG PLC] (IMS01J06-E□)
Start-up procedures
☞ See 5.3 Start-up Procedures (P. 49)
Operations

1.3 Checking the Products

When unpacking your new instrument, please confirm that the following products are included. If any of the products are missing, damaged, or if your manual is incomplete, please contact RKC sales office or agent for replacement.

☐ Power supply/CPU module, H-PCP-J .... 1 module

One H-PCP-J module (power supply/CPU module) is required for each control unit.

☐ Function modules .... Required number of modules

Reference purchase order for description of function modules.

☐ DIN rail holding clips .... Two clips per unit

☐ H-PCP-J Instruction Manual (IMS01J02-E☐) ....1 copy

☐ PLC Communication Instruction Manual (IMS01J0☐-E☐) ..... 1 copy

The specified PLC Communication Instruction Manual is attached.

- PLC Communication Instruction Manual [For MITSUBISHI PLC] (IMS01J03-E☐)
- PLC Communication Instruction Manual [For OMRON PLC] (IMS01J04-E☐)
- PLC Communication Instruction Manual [For SHARP PLC] (IMS01J05-E☐)
- PLC Communication Instruction Manual [For LG PLC] (IMS01J06-E☐)

☐ Hardware Instruction Manual (IMSRM15-E☐) ....1 copy

☐ H-DO-G Instruction Manual (IMS01K01-E☐) .... 1 copy

This manual is attached regardless of the presence or absence of the H-DO-G module.

☐ H-SIO-A Instruction Manual (IMS01L01-E☐) .... 1 copy

This manual is attached regardless of the presence or absence of the H-SIO-A module.

1.4 Confirmation of the Model Code

The model code for the instrument you received is listed below. Please confirm that you have received the correct instrument by checking the model code label, located on the left side of the module, with this list. If the product you received is not the one ordered, please contact RKC sales office or agent for replacement.

H-PCP- J - □ □ □ - D ∗ □ □ - □ □ □
(1) (2) (3) (4) (5) (6) (7) (8) (9)

(1) Type

J: PLC communication type

(2) Power supply voltage

1: 100 to 120 V AC
2: 200 to 240 V AC
3: 24 V DC

(3) Communication interface (COM. PORT1/COM. PORT2)

4: RS-422A
5: RS-485

(4) Communication interface (COM. PORT3)

1: RS-232C
4: RS-422A
5: RS-485

(5) DO signal

D: Open collector output

(6) Alarm 1 function *

N: No alarm function
□: See Alarm code table (P. 5)

(7) Alarm 2 function *

N: No alarm function
□: See Alarm code table (P. 5)

(8) An attached instruction manual

00: H-PCP-J Instruction Manual
02: H-PCP-J Instruction Manual and PLC Communication Instruction Manual [For MITSUBISHI PLC]
03: H-PCP-J Instruction Manual and PLC Communication Instruction Manual [For OMRON PLC]
04: H-PCP-J Instruction Manual and PLC Communication Instruction Manual [For SHARP PLC]
05: H-PCP-J Instruction Manual and PLC Communication Instruction Manual [For LG PLC]

(9) Instruction manual language

E: English
J: Japanese

* It is alarm function of H-TIO-□ module, H-CIO-A module and H-SIO-A module.

Initial code

NNNN - □ □ - □ □
(1) (2) (3) (4)

(1) TI alarm 1 function

N: No alarm function
□: See TI/AI alarm code table (P. 5)

(2) TI alarm 2 function

N: No alarm function
□: See TI/AI alarm code table (P. 5)

(3) AI alarm 1 function

N: No alarm function
□: See TI/AI alarm code table (P. 5)

(4) AI alarm 2 function

N: No alarm function
□: See TI/AI alarm code table (P. 5)

Alarm code table

A: Deviation high alarm
B: Deviation low alarm
C: Deviation high and low alarm
D: Band alarm
E: Deviation high alarm with hold action
F: Deviation low alarm with hold action
G: Deviation high and low alarm with hold action
H: Process high alarm
J: Process low alarm
K: Process high alarm with hold action
L: Process low alarm with hold action

Special alarm function

Q: Deviation high alarm with re-hold action
R: Deviation low alarm with re-hold action
T: Deviation high and low alarm with re-hold action

TI/AI alarm code table

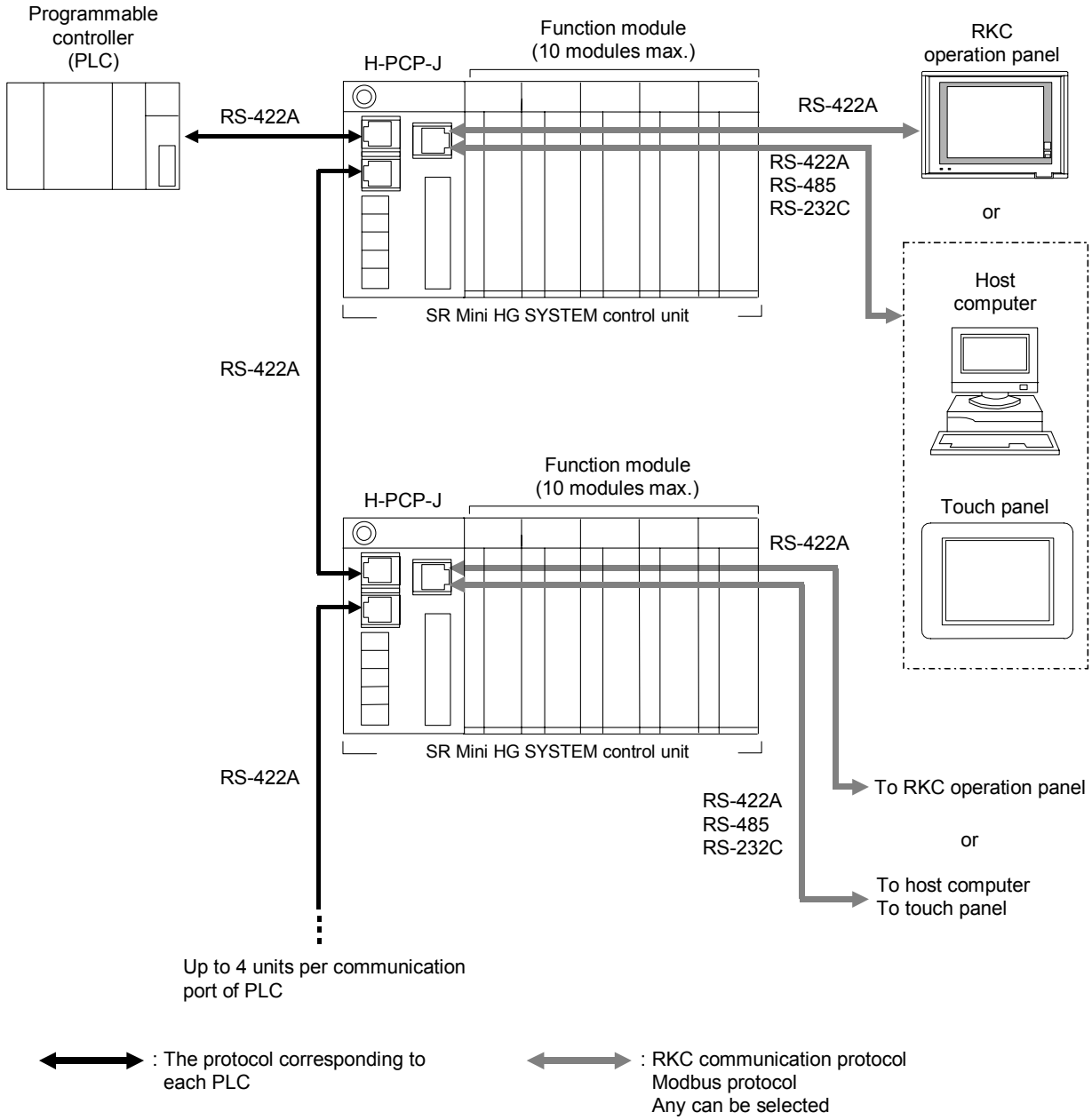
H: Process high alarm
J: Process low alarm
K: Process high alarm with hold action
L: Process low alarm with hold action

The selected alarm function will be common for all the modules with alarm functions in the control unit.

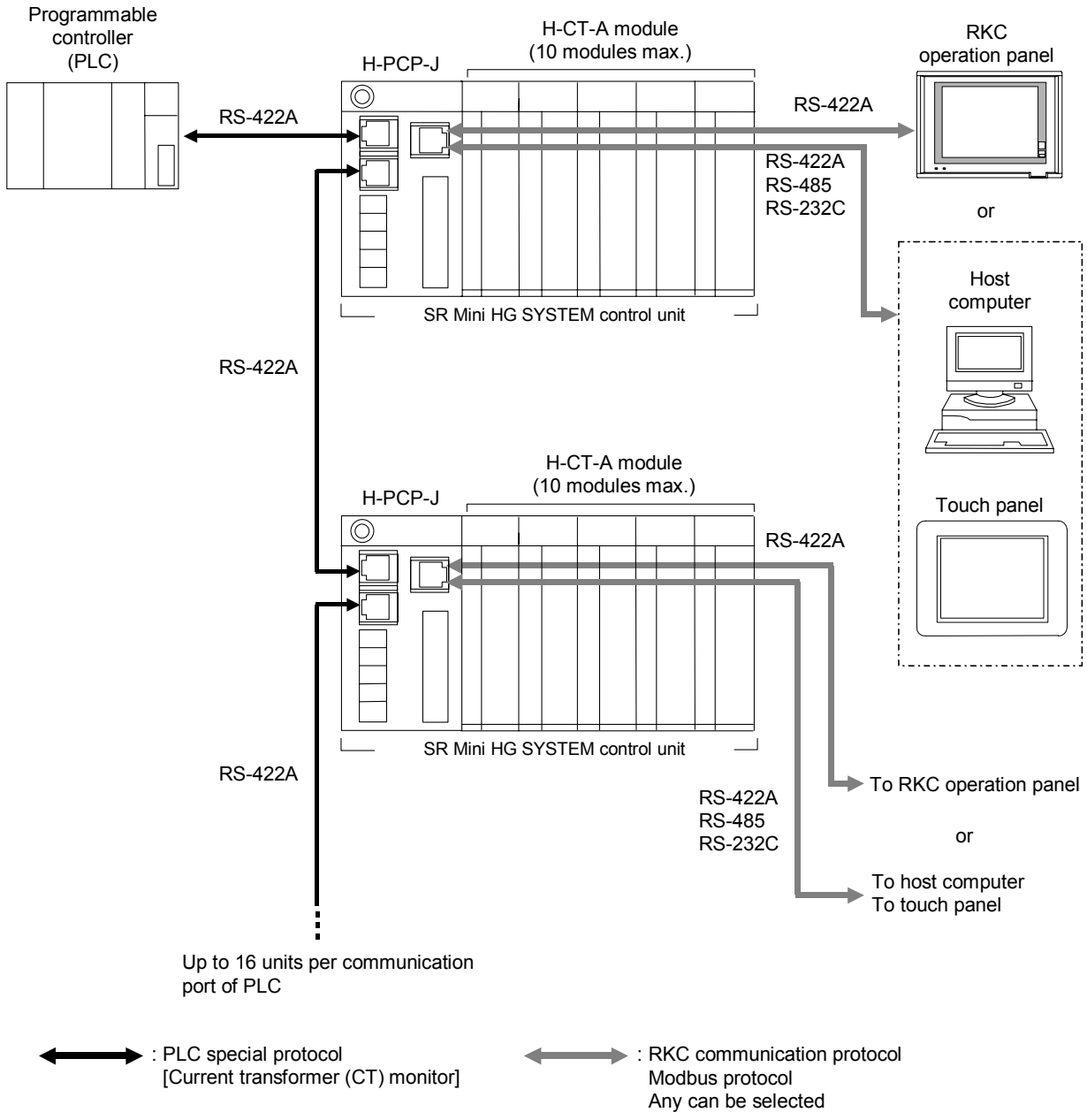
1.5 System Configuration

The system configuration example that used operation panel, host computer, touch panel and programmable controller (hereafter called PLC) is shown.

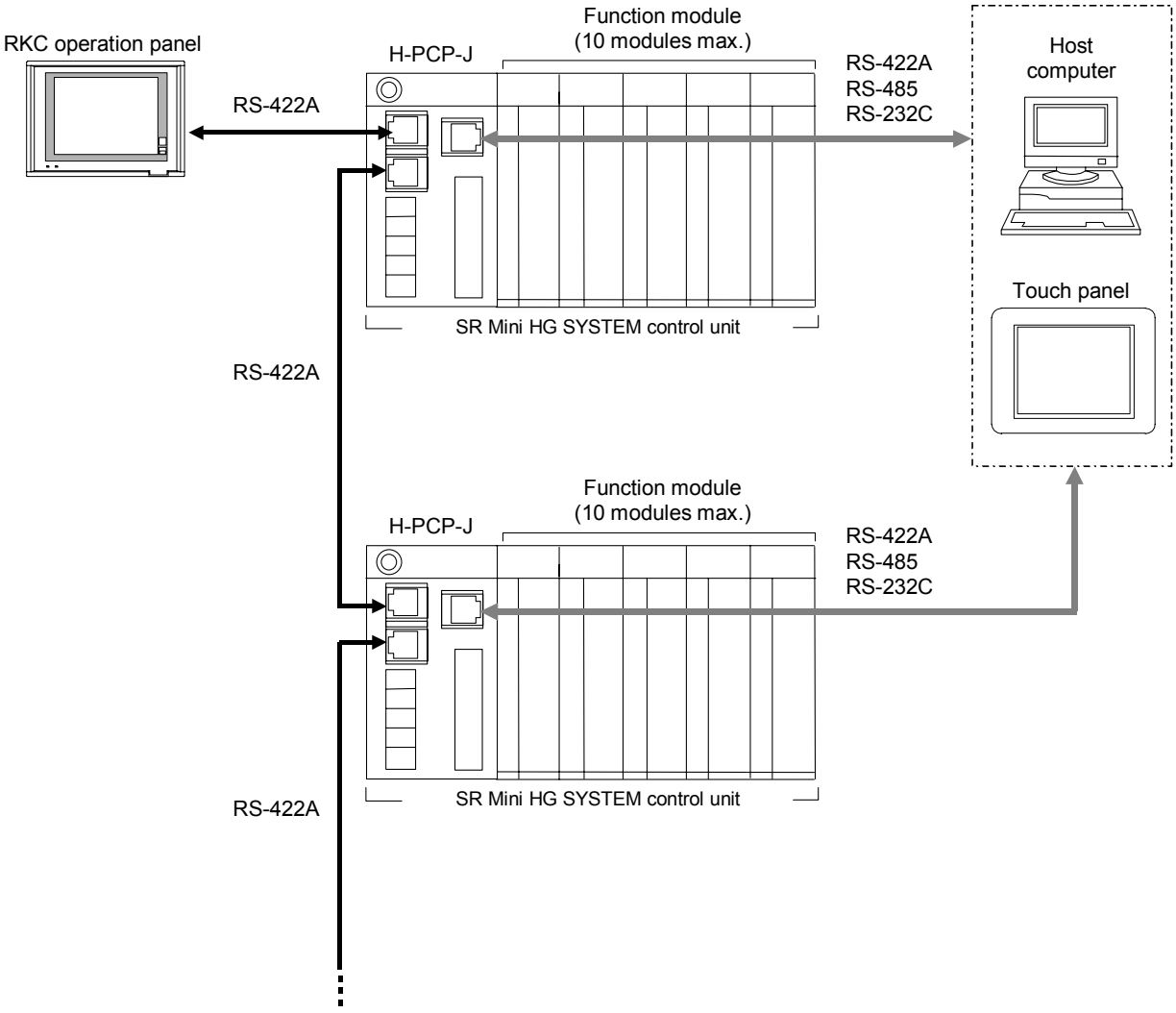
- **Example 1: PLC is used**



- **Example 2: Current transformer (CT) monitor (PLC is used)**



- **Example 3: RKC operation panel is used**

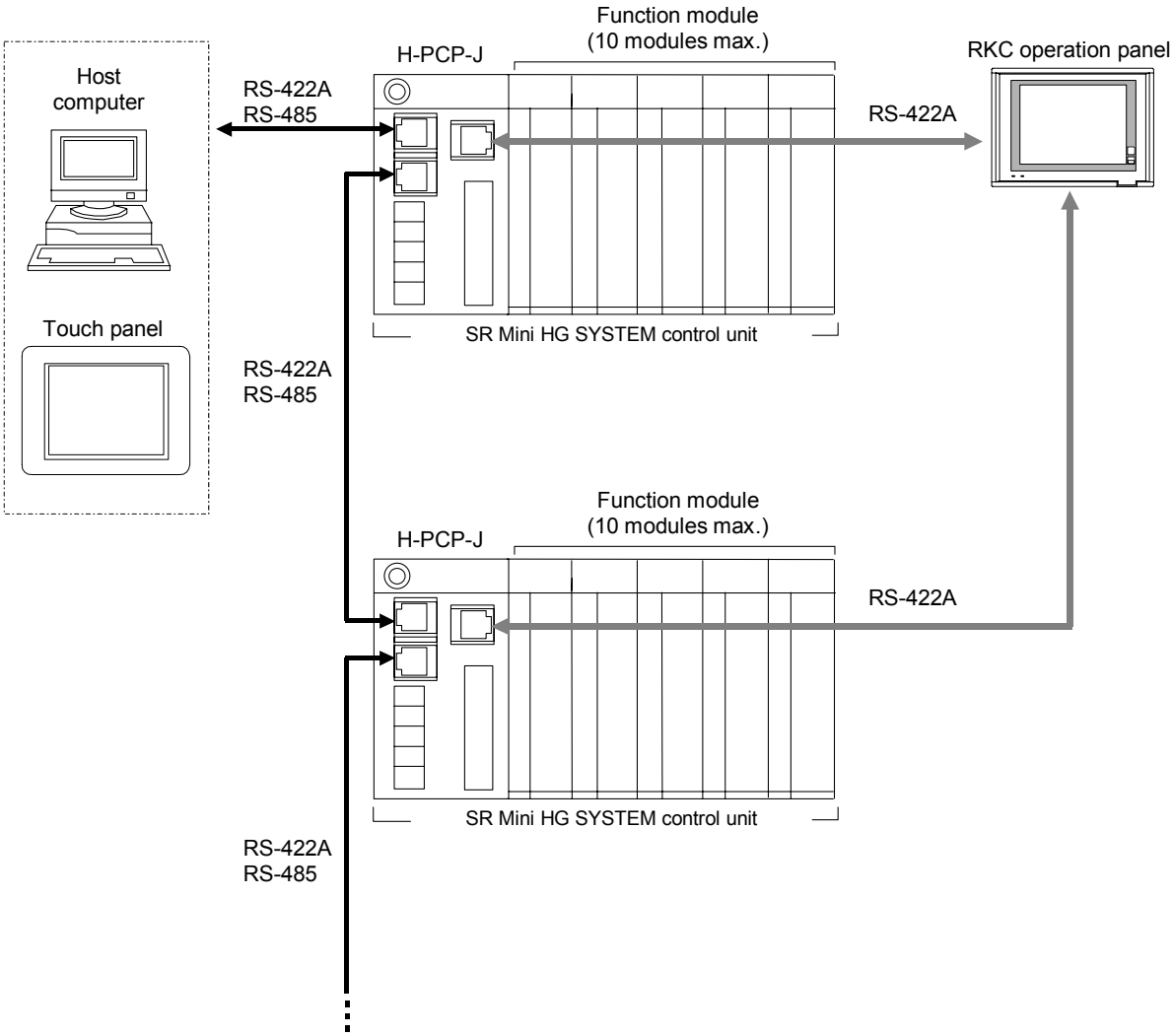


When the RKC operation panel is connected: Up to 8 units

: RKC communication protocol

: RKC communication protocol
Modbus protocol
Any can be selected

- **Example 4: Host computer or touch panel is used**



When the host computer is connected: Up to 16 units
When the is touch panel connected: Up to 16 units

: RKC communication protocol
Modbus protocol
Any can be selected

: RKC communication protocol

■ Usable modules

The following function modules can be used in combination with the H-PCP-J module. However, usable module is different by protocol.

- **RKC communication protocol/Modbus protocol**

Function module	Type			
Temperature control module	H-TIO-A H-TIO-E H-TIO-J	H-TIO-B H-TIO-F H-TIO-P	H-TIO-C H-TIO-G H-TIO-R	H-TIO-D H-TIO-H
Position proportioning control module	H-TIO-K			
Speed control module	H-SIO-A			
Temperature input module	H-TI-A	H-TI-B	H-TI-C	
Cascade control module	H-CIO-A			
Current transformer input module	H-CT-A			
Digital input module	H-DI-A	H-DI-B		
Digital output module	H-DO-A H-DO-G	H-DO-B	H-DO-C	H-DO-D
Analog input module	H-AI-A	H-AI-B		
Analog output module	H-AO-A	H-AO-B		

- **PLC special protocol**

Function module	Type			
Temperature control module	H-TIO-A H-TIO-E H-TIO-J	H-TIO-B H-TIO-F H-TIO-P	H-TIO-C H-TIO-G H-TIO-R	H-TIO-D H-TIO-H
Position proportioning control module *	H-TIO-K			
Speed control module *	H-SIO-A			
Cascade control module *	H-CIO-A			
Current transformer input module	H-CT-A			

* There is restriction on usable data in case of PLC communication protocol.

- **Current transformer (CT) monitor special protocol**

Function module	Type
Current transformer input module	H-CT-A

☞ For the function modules, see the **Hardware Instruction Manual** (**IMSRM15-E□**), **H-DO-G Instruction Manual** (**IMS01K01-E□**) and **H-SIO-A Instruction Manual** (**IMS01L01-E□**).

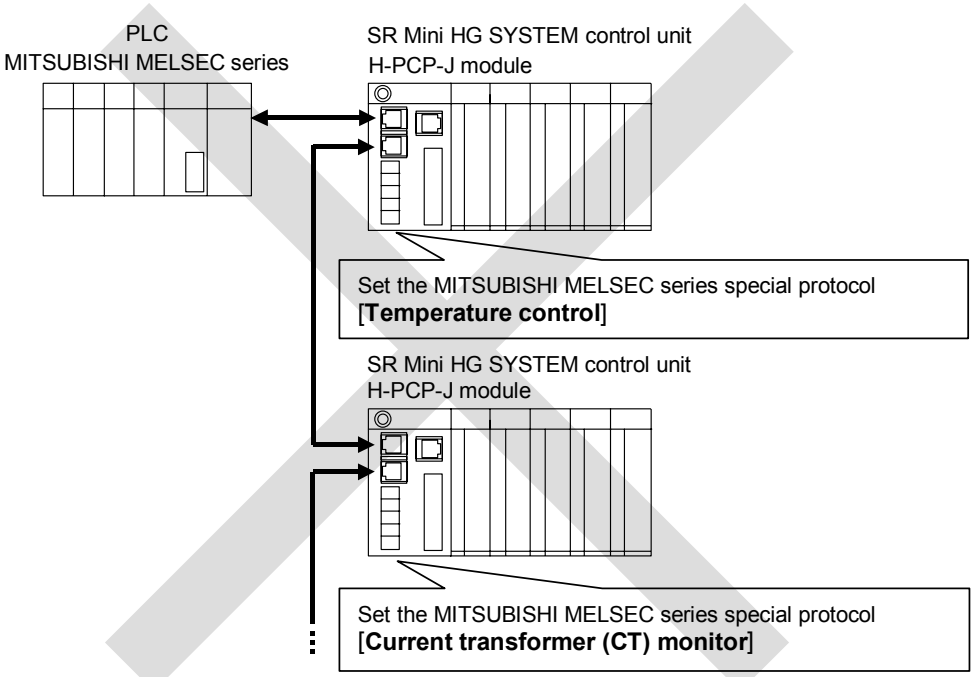
Maximum number of function modules that can be connected to one control unit:

10 modules/control unit

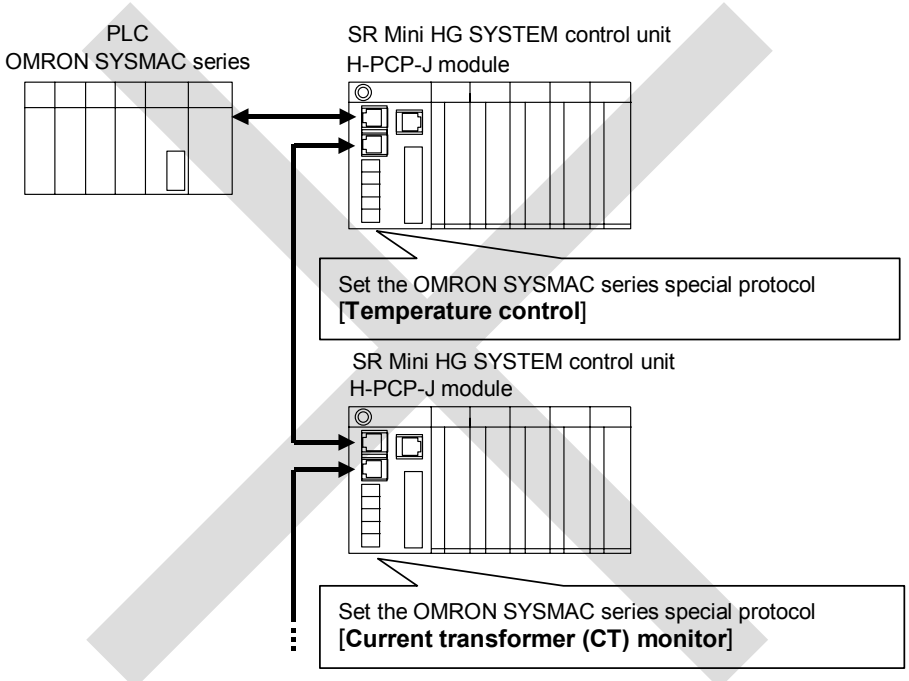
■ Precautions for PLC communication system configuration

When a system is configured by connecting a PLC, the protocol dedicated to the PLC (for temperature control) cannot be used together with the current transformer (CT) monitor.

- **MITSUBISHI MELSEC series**

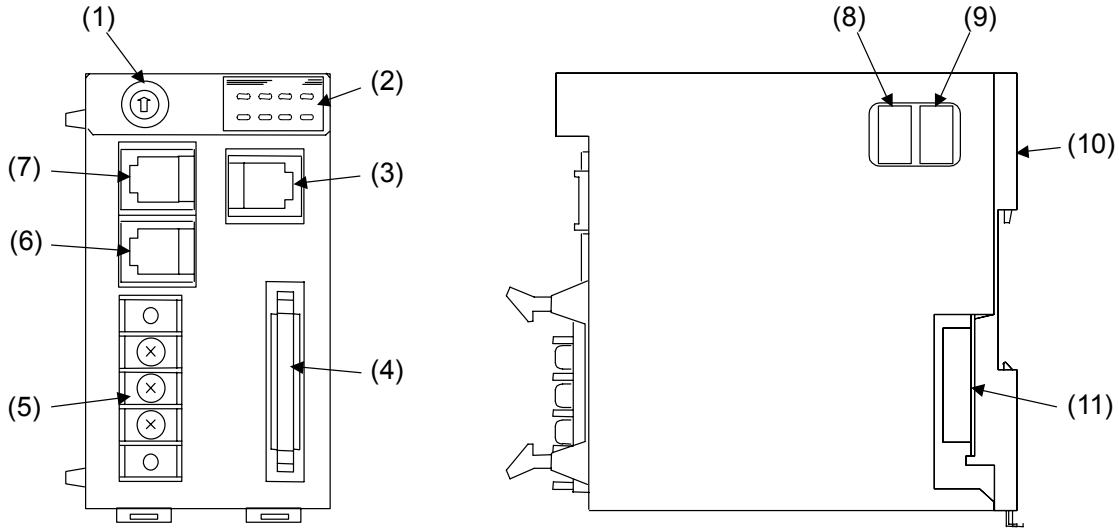

PLC
MITSUBISHI MELSEC series
SR Mini HG SYSTEM control unit
H-PCP-J module
Set the MITSUBISHI MELSEC series special protocol
[Temperature control]
SR Mini HG SYSTEM control unit
H-PCP-J module
Set the MITSUBISHI MELSEC series special protocol
[Current transformer (CT) monitor]

- **OMRON SYSMAC series**


PLC
OMRON SYSMAC series
SR Mini HG SYSTEM control unit
H-PCP-J module
Set the OMRON SYSMAC series special protocol
[Temperature control]
SR Mini HG SYSTEM control unit
H-PCP-J module
Set the OMRON SYSMAC series special protocol
[Current transformer (CT) monitor]

1.6 Parts Description

■ H-PCP-J module



No.	Name	Description
(1)	Unit address setting switch	Set unit address number of control unit Setting range: 0 to 15 (0 to F, hexadecimal)
(2)	Status indication lamps RX1 RX2 EVENT FAIL TX1 TX2 START RUN	RX1 (data reception) lamp [Yellow] ON during COM.PORT1/COM.PORT2 data is correctly received RX2 (data reception) lamp [Yellow] ON during COM.PORT3 data is correctly received EVENT lamp [Green] ON during event operation (Always OFF because there is not event function) FAIL lamp [Red] ON during abnormal operation OFF during normal operation TX1 (data transmission) lamp [Yellow] ON during COM.PORT1/COM.PORT2 data is correctly sent TX2 (data transmission) lamp [Yellow] ON during COM.PORT3 data is correctly sent START lamp [Green] ON during control RUN lamp [Green] Flashing during normal operation ON during abnormal operation

Continued on the next page.

Continued from the previous page.

No.	Name	Description
(3)	Modular connector (COM.PORT3)	Connector for connection with the host computer, touch panel or operation panel (Conforming to RS-232C/RS-422A/RS-485)
(4)	DO connector	Connector for digital output
(5)	Power terminals	Power supply and ground terminals
(6)	Modular connector (COM.PORT2)	Connector for the control unit addition (Conforming to RS-422A/RS-485)
(7)	Modular connector (COM.PORT1)	Connector for connection with the host computer, touch panel, operation panel or PLC (Conforming to RS-422A/RS-485)
(8)	COM.PORT3 setting switch (SW3)	Set communication protocol, data bit configuration, communication speed and initialize method of modular connector (COM.PORT3).
(9)	COM.PORT1/COM.PORT2 setting switch (SW2)	Set communication protocol, data bit configuration and communication speed of modular connector (COM.PORT1/COM.PORT2).
(10)	Mother block	Module DIN rail mounting connector
(11)	Module connector	Connector for power supply and bus connection

2. SPECIFICATIONS

■ Basic functions

Data supervision: Operating and system data

Control unit diagnosis: Function modules configuration check

Self-diagnostic: Check item: ROM/RAM check
Watchdog timer
Power supply monitoring

If error occurs in self-diagnosis, the hardware will automatically return the module outputs to the OFF position.

Memory backup: Lithium battery for RAM backup, approximate 10 years life for data retention.

■ Power input

Power supply voltage: 100 to 120 V AC (50/60 Hz) , 200 to 240 V AC (50/60 Hz) or 24 V DC
Specify when ordering

Power supply voltage range: 100 to 120 V AC: 90 to 132 V AC
200 to 240 V AC: 180 to 264 V AC
24 V DC: 21.6 to 26.4 V DC

Power consumption: 100 to 120 V AC: 40 VA max.
200 to 240 V AC: 50 VA max.
24 V DC: 21 W max. 1 A or less

Surge current: 30 A or less

■ Power output (Function module power)

Output voltage/current: 5 V DC, 1.7 A max.
12V DC, 1.0 A max.

Overcurrent protection: Fold-back limiting method: 5 V

■ Digital output

Number of outputs: 8 points

Output type: Open collector output

Number of common points: Vcc: 2 points, GND: 2 points (8 points/common)

Isolation method: Photocoupler isolation

Load voltage: 12 to 24 V DC

Maximum load current: 0.1 A/point, 0.8 A/common

Output data: Digital output can be selected from the following:

- Temperature alarm (Alarm 1, Alarm 2)
- Heater break alarm (HBA)
- Burnout
- TI Alarm (Alarm 1, Alarm 2)
- AI Alarm (Alarm 1, Alarm 2)
- Control loop break alarm (LBA)
- Temperature rise completion
- Temperature rise completion
- FAIL output
- PLC communication status
- Unused

■ Communication functions

● COM.PORT1/COM.PORT2

Interface: Based on RS-422A, EIA standard
Based on RS-485, EIA standard
Specify when ordering

Connection method: RS-422A: 4-wire system, multi-drop connection
RS-485: 2-wire system, multi-drop connection

Protocol:
- Based on ANSI X3.28 subcategory 2.5 B1 (RKC communication)
  - Error control: Vertical parity (when parity bit is selected)
    Horizontal parity
  - Data types: ASCII 7-bit code
- Modbus protocol
  - Signal transmission mode: Remote Terminal Unit (RTU) mode
  - Function codes:
    - 03H Read holding registers
    - 06H Preset single register
    - 08H Diagnostics (loopback test)
    - 10H Preset multiple registers
  - Error check method: CRC-16
  - Error codes:
    - 1: Function code error (An unsupported function code was specified)
    - 2: – When written to read only data
      – When any address other than 0000H to 02EEH is specified (However, 07D0H to 0BB7H are excluded)
    - 3: – When the data written exceeds the setting range
      – When the specified number of data items in the query message exceeds the maximum number of data items available
- MITSUBISHI MELSEC series special protocol
  AnA/AnUCPU common command (QW/QR)
- MITSUBISHI MELSEC series special protocol
  ACPU common command (WW/WR)
- OMRON SYSMAC series special protocol
- SHARP JW50H/70H/100H and JW30H special protocol
  Computer link (command mode)
- LG MASTER-K and GLOFA-GM series special protocol

Protocol can be selected with switch

Synchronous method: Start/stop synchronous type

Communication speed: 9600 bps, 19200 bps, 38400 bps
Communication speed can be selected with switch

Data bit configuration:
Start bit: 1
Data bit: 7 or 8
Parity bit: Without, Odd or Even
Without for 8 data bits
Stop bit: 1 or 2
Data bit configuration can be selected with switch

Connected equipment: Host computer, touch panel, operation panel or PLC

Signal logic: RS-422A/RS-485

Signal voltage	Logic
V (A) – V (B) ≥ 2 V	0 (SPACE)
V (A) – V (B) ≤ –2 V	1 (MARK)

Voltage between V (A) and V (B) is the voltage of (A) terminal for the (B) terminal.

● **COM.PORT3**

Interface: Based on RS-232C, EIA standard
Based on RS-422A, EIA standard
Based on RS-485, EIA standard
Specify when ordering

Connection method: RS-232C: Point-to-point connection
RS-422A: 4-wire system, multi-drop connection
RS-485: 2-wire system, multi-drop connection

Protocol:
- Based on ANSI X3.28 subcategory 2.5 B1 (RKC communication)
  - Error control: Vertical parity (when parity bit is selected)
    Horizontal parity
  - Data types: ASCII 7-bit code
- Modbus protocol
  - Signal transmission mode: Remote Terminal Unit (RTU) mode
  - Function codes:
    - 03H Read holding registers
    - 06H Preset single register
    - 08H Diagnostics (loopback test)
    - 10H Preset multiple registers
  - Error check method: CRC-16
  - Error codes:
    - 1: Function code error (An unsupported function code was specified)
    - 2: – When written to read only data
      – When any address other than 0000H to 02EEH is specified (However, 07D0H to 0BB7H are excluded)
    - 3: – When the data written exceeds the setting range
      – When the specified number of data items in the query message exceeds the maximum number of data items available

Protocol can be selected with switch

Synchronous method: Start/stop synchronous type

Communication speed: 9600 bps, 19200 bps, 38400 bps
Communication speed can be selected with switch

Data bit configuration: Start bit: 1
Data bit: 7 or 8
Parity bit: Without, Odd or Even
Without for 8 data bits
Stop bit: 1 or 2
Data bit configuration can be selected with switch

Connected equipment: Host computer, touch panel or operation panel

Signal logic: RS-232C

Signal voltage	Logic
+3 V or more	0 (SPACE)
–3 V or less	1 (MARK)

RS-422A/RS-485

Signal voltage	Logic
V (A) – V (B) ≥ 2 V	0 (SPACE)
V (A) –V (B) ≤ –2 V	1 (MARK)

Voltage between V (A) and V (B) is the voltage of (A) terminal for the (B) terminal.

■ General specifications

Insulation resistance: Between power and ground terminals: 20 MΩ or more at 500 V DC
Between output and ground terminals: 20 MΩ or more at 500 V DC

Withstand voltage: Between power and ground terminals: 1 minute at 1500 V AC
Between output and ground terminals: 1 minute at 1500 V AC

Withstand noise: AC power: 2500 V (peak to peak)
DC power: 1500 V (peak to peak)
Pulse width: 1 μs
Rise time: 1 ns
By noise simulator

Ambient temperature: 0 to 50 °C

Ambient humidity: 45 to 85 % RH
(Absolute humidity: MAX. W. C 29 g/m^3 dry air at 101.3 kPa)

Usage atmosphere: There must be no corrosive gas and dust must not be excessive.

Ambient temperature for storage: –20 to +50 °C

Ambient humidity for storage: 95 % RH or less (Non condensing)

Dimensions: 48 (W) × 96 (H) × 100 (D) mm

Weight: Approx. 300 g

3. MOUNTING

This chapter describes the mounting procedures for the H-PCP-J modules. For details of the mounting procedures for other modules and the mounting position of the control unit, see the **Hardware Instruction Manual (IMSRM15-E□)**.

> ⚠ **WARNING**
>
> To prevent electric shock or instrument failure, always turn off the power before mounting or removing the modules.

3.1 Mounting Cautions

(1) This instrument is intended to be used under the following environmental conditions. (**IEC61010-1)** [OVERVOLTAGE CATEGORY II, POLLUTION DEGREE 2]

(2) Use this instrument within the following ambient temperature and ambient humidity.

- Ambient temperature: 0 to 50 °C
- Ambient humidity: 45 to 85 % RH
  (Absolute humidity: MAX. W. C 29 g/m^3 dry air at 101.3 kPa)

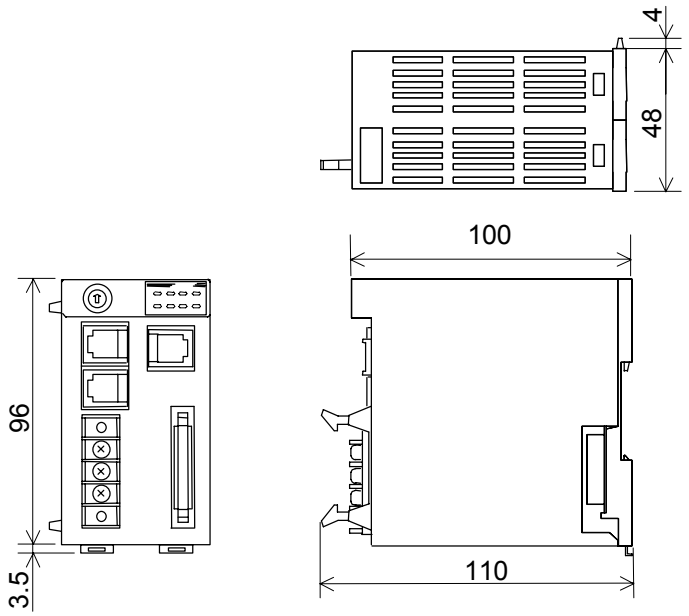
(3) Avoid the following conditions when selecting the mounting location:

- Rapid changes in ambient temperature which may cause condensation.
- Corrosive or inflammable gases.
- Direct vibration or shock to the mainframe.
- Water, oil, chemicals, vapor or steam splashes.
- Excessive dust, salt or iron particles.
- Excessive induction noise, static electricity, magnetic fields or noise.
- Direct air flow from an air conditioner.
- Exposure to direct sunlight.
- Excessive heat accumulation.

3.2 Dimensions

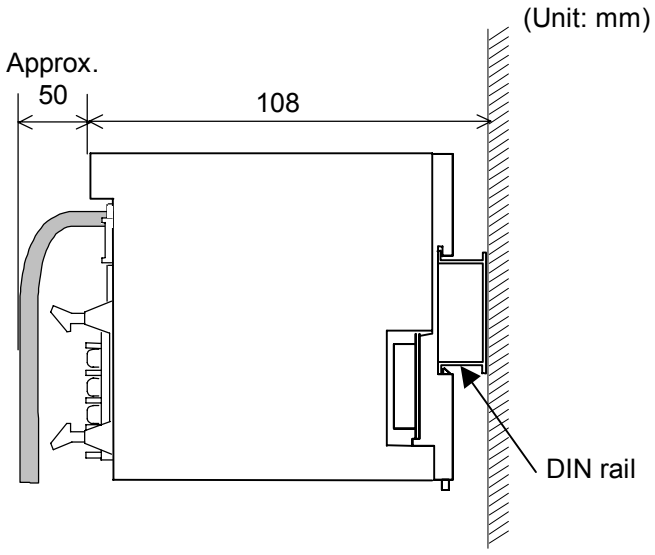
■ External dimensions

(Unit: mm)



■ Module mounting depth

The mounting depth of each module is 108 mm from the mounting surface inside the panel to the front of the module with the module mounted on the DIN rail. However, when modular connector cables are plugged in, additional depth is required.



3.3 Mounting the Mother Block

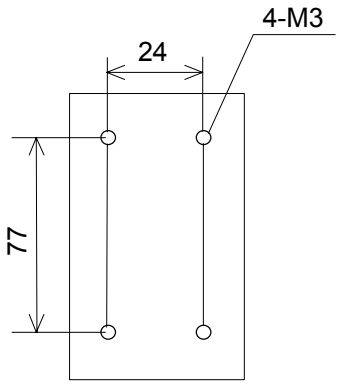
The mother block can be mounted to a panel or DIN rail.

Mount the H-PCP-J module on the left side of the control unit.

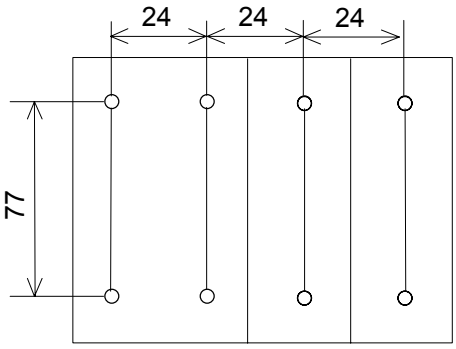
■ Panel mounting directions

1. Refer to both the panel mounting dimensions below and the external dimensions in previous section when selecting the location.

(Unit: mm)



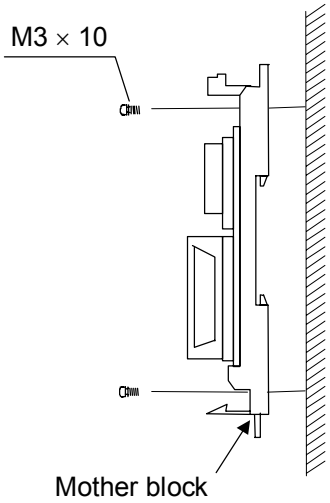
H-PCP-J module



Dimensions for multiple module mounting

2. Remove the module from the mother block. For details of removing the module, see **3.5 Removing the Module Mainframe (P. 24)**.

3. Connect the mother blocks together before tightening the screws on the panel. (Customer must provide the set screws)



Recommended tightening torque: 0.3 N·m (3 kgf·cm)

When the mother block is mounted on the panel, 50 mm or more space is required at the top and bottom of the mother block to attach the module mainframe.

■ DIN rail mounting directions

1. Remove the module mainframe from the mother block. For details of removing the module mainframe, see **3.5 Removing the Module Mainframe (P. 24)**.

2. Pull down both locking devices at the bottom of the mother block. (Figure 1)

3. Attach the top bracket of the mother block to the DIN rail and push the lower section into place on the DIN rail. (Figure 2)

4. Slide the locking devices up to secure the mother block to the DIN rail. (Figure 3)

5. Slide connectors together to complete mother block installation. (Figure 4)

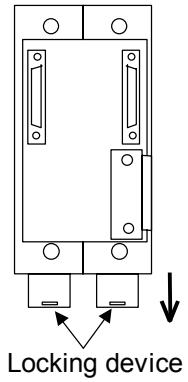


Figure 1

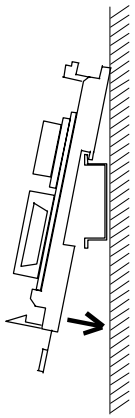


Figure 2

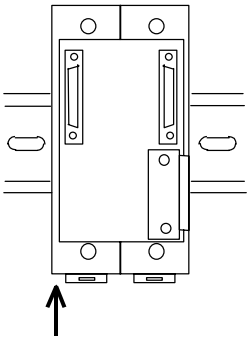


Figure 3

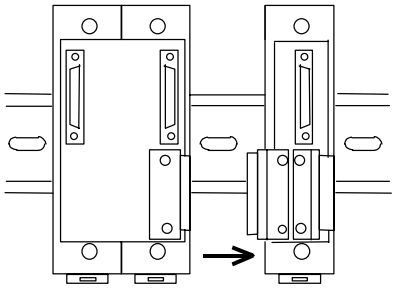


Figure 4

When the mother block is mounted on panel, 50 mm or more space is required at the top and bottom of the mother block to attach the module mainframe.

3.4 Mounting the Module Mainframe

1. Place the module mainframe opening on top of the mother block tab. (Figure 1)

2. Snap the lower part of module mainframe on to the mother block. (Figure 2)
A snapping sound will be heard when module mainframe is securely connected to mother block.

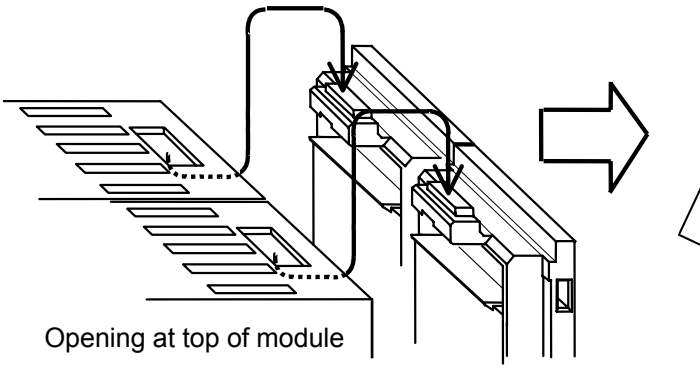


Figure 1

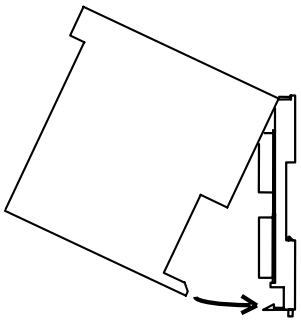
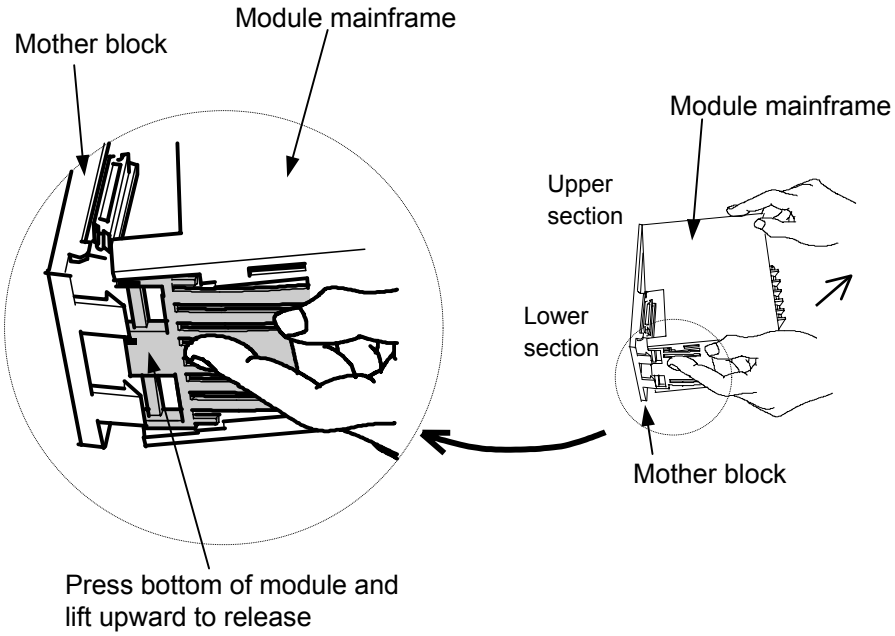


Figure 2

3.5 Removing the Module Mainframe

To separate the module mainframe from the mother block, press the bottom on the module, lifting upward, to release connection.



4. WIRING

4.1 Wiring

⚠ WARNING

To prevent electric shock or instrument failure, do not turn on the power until all the wiring is completed.

CAUTION

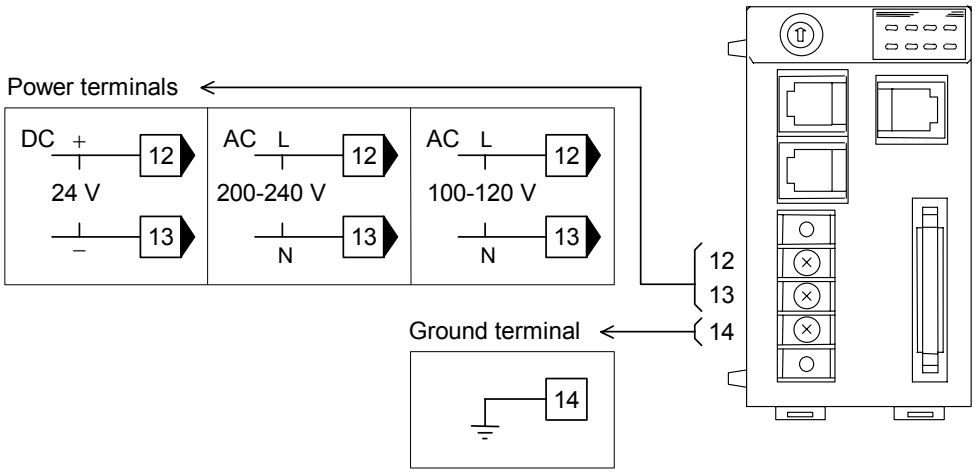
Power supply wiring:

- Use power supply as specified in power supply voltage range.
- Power supply wiring must be twisted and have a low voltage drop.
- Provide separate power supply for this instrument independent of other input/output circuits, motors, equipment and operating circuits.
- If there is electrical noise in the vicinity of the instrument that could affect operation, use a noise filter.
  - Shorten the distance between the twisted power supply wire pitches to achieve the most effective noise reduction.
  - Always install the noise filter on a grounded panel.
  - Minimize the wiring distance between the noise filter output and the instrument power supply terminals to achieve the most effective noise reduction.
  - Do not connect fuses or switches to the noise filter output wiring as this will reduce the effectiveness of the noise filter.
  - Take into consideration the instrument power supply voltage and filter frequency characteristics when selecting the most effective noise filter.
- To the instrument with power supply of 24 V, please be sure to supply the power from SELV circuit.

Ground wiring:

- Ground the instrument separately from other equipment. The grounding resistance should be 100 Ω or less.
- Use grounding wires with a cross section area of 2.0 mm^2 or more.

■ Terminal configuration



Terminal Screws
Screw size: M3
Recommended tightening torque: 0.4 N·m (4 kgf·cm)

● Power supply

90 to 132 V AC Including power supply voltage variations
(Rating: 100 to 120 V AC, Single phase 50/60 Hz)
180 to 264 V AC Including power supply voltage variations
(Rating: 200 to 240 V AC, Single phase 50/60 Hz)
21.6 to 26.4 V DC Including power supply voltage variations
(Rating: 24 V DC)
Specify when ordering

● Ground

Ground the module using grounding wire with a cross section area of 2 mm^2 or more and with a grounding resistance of 100 Ω or less. Do not connect the grounding wire to the grounding wire of any other equipment.

4.2 Connections

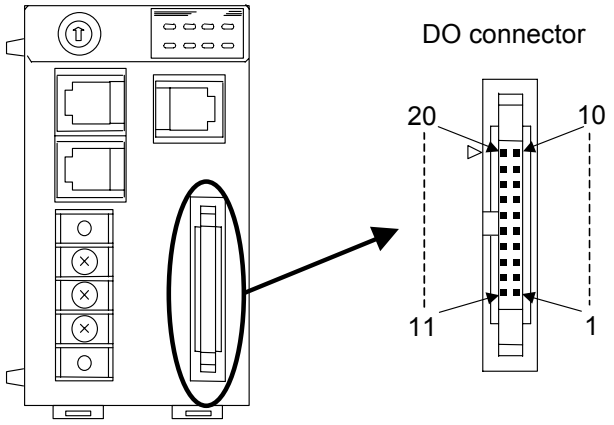
⚠ WARNING

To prevent electric shock or instrument failure, turn off the power before connecting or disconnecting the instrument and peripheral equipment.

CAUTION

- Connect connectors correctly in the right position. If it is forcibly pushed in with pins in the wrong positions, the pins may be bent resulting in instrument failure.
- When connecting or disconnecting the connectors, do not force it too far to right and left or up and down, but move it on the straight. Otherwise, the connector pins may be bent, causing instrument failure.
- When disconnecting a connector, hold it by the connector itself. Disconnecting connectors by yanking on their cables can cause breakdowns.
- To prevent malfunction, never touch the contact section of a connector with bare hands or with hands soiled with oil or the like.
- To prevent malfunction, connect cable connectors securely, then firmly tighten the connector fastening screws.
- To prevent damage to cables, do not bend cables over with excessive force.
- If the instrument is easily affected by noise, use the ferrite core in the both ends of the communication cable (nearest the connector).

4.2.1 DO connector connection



Output type: Open collector output
Number of common points:
Vcc: 2 points,
GND: 2 points (8 points/common)
Isolation method:
Photocoupler isolation
Load voltage: 12 to 24 V DC
Maximum load current:
0.1 A/point, 0.8 A/common
Connector used:
MIL connector AXM220011
(Manufactured by Matsushita Electric Works, Ltd.)

Connector pin number and signal details

Pin No.	Description
20	VCC (COM) +
19	GND (COM) –
18	Unused
17	Unused
16	Unused
15	Unused
14	Unused
13	Unused
12	Unused
11	Unused

Pin No.	Description
10	VCC (COM) +
9	GND (COM) –
8	DO8
7	DO7
6	DO6
5	DO5
4	DO4
3	DO3
2	DO2
1	DO1

Recommended terminals

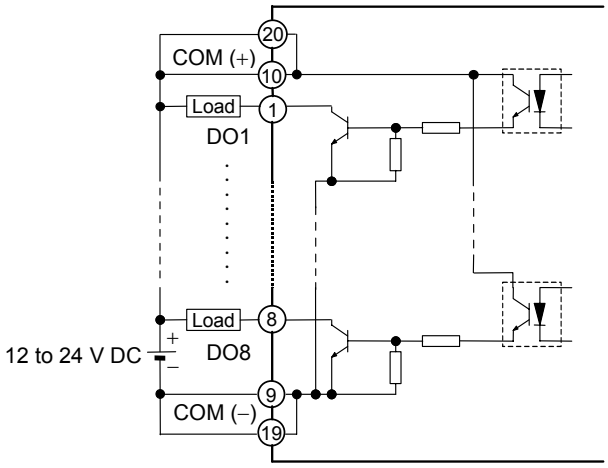
- When using the relay contact outputs
  PC relay terminal: Model No.: RT1S-OD08-24V-S [Part No.: AY112402]
  Model No.: RT1S-OD08-12V-S [Part No.: AY112401]
  (Manufactured by Matsushita Electric Works, Ltd.)
- When using the PC terminal that interface relay or SSR (sold separately) is installed
  PC terminal: Model No.: RT1-OD08-24V-S [Part No.: AY102402]
  Model No.: RT1-OD08-12V-S [Part No.: AY102401]
  (Manufactured by Matsushita Electric Works, Ltd.)
- When using the terminal for open collector outputs
  Connector terminal: Model No.: CT1-20 [Part No.: AYT1120]
  (Manufactured by Matsushita Electric Works, Ltd.)

Recommended cable and connector

- PC relay terminals/PC terminals expansion cable
  Part No.: AY1584□ * (Manufactured by Matsushita Electric Works, Ltd.)
  * □ → 0: 70 mm 1: 250 mm 2: 500 mm 3: 1000 mm 5: 2000 mm
- MIL connector
  Part No.: AXM120415 (Manufactured by Matsushita Electric Works, Ltd.)

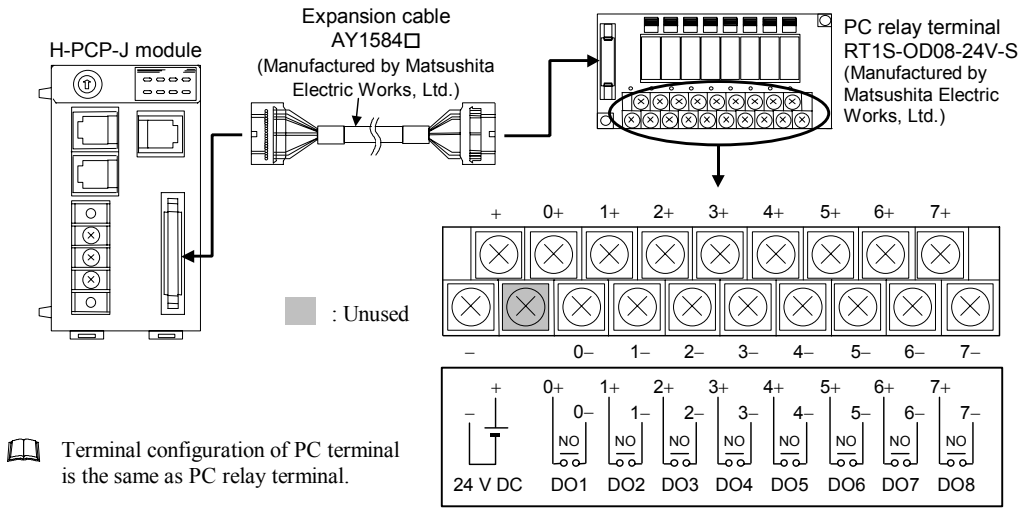
For the DO allocation, see the **H-PCP-J module DO type selection (P. 100, 141)**.

Open collector output wiring example



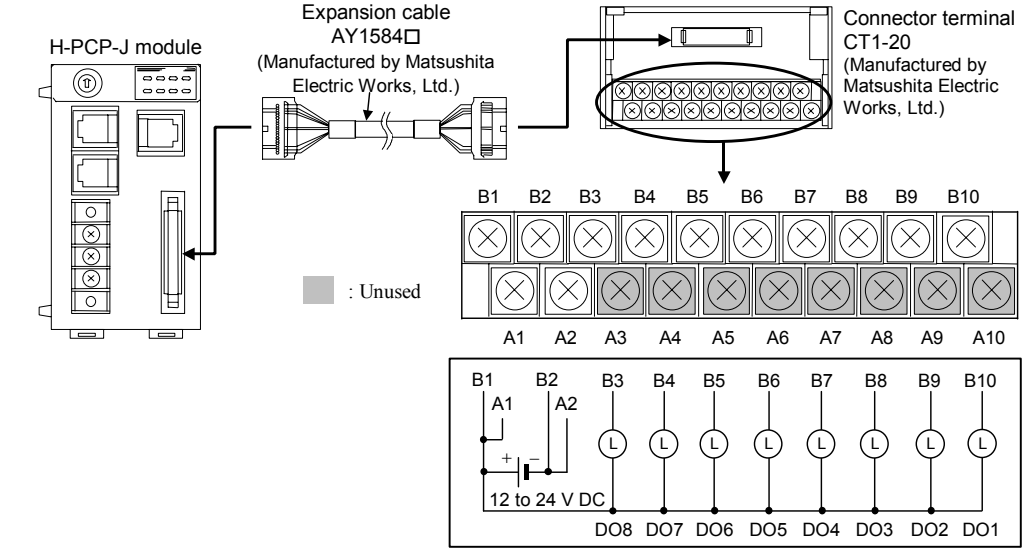
In using the open collector output, an external power supply of 24 V DC is required.
Note that if this power supply is not connected, there will be no output from the module.

PC relay terminal connecting example


H-PCP-J module
Expansion cable
AY1584□
(Manufactured by Matsushita Electric Works, Ltd.)
PC relay terminal
RT1S-OD08-24V-S
(Manufactured by Matsushita Electric Works, Ltd.)
+ 0+ 1+ 2+ 3+ 4+ 5+ 6+ 7+
– 0– 1– 2– 3– 4– 5– 6– 7–
: Unused
+ – 0+ 0– 1+ 1– 2+ 2– 3+ 3– 4+ 4– 5+ 5– 6+ 6– 7+ 7–
NO
24 V DC DO1 DO2 DO3 DO4 DO5 DO6 DO7 DO8

Terminal configuration of PC terminal is the same as PC relay terminal.

Connector terminal connecting example

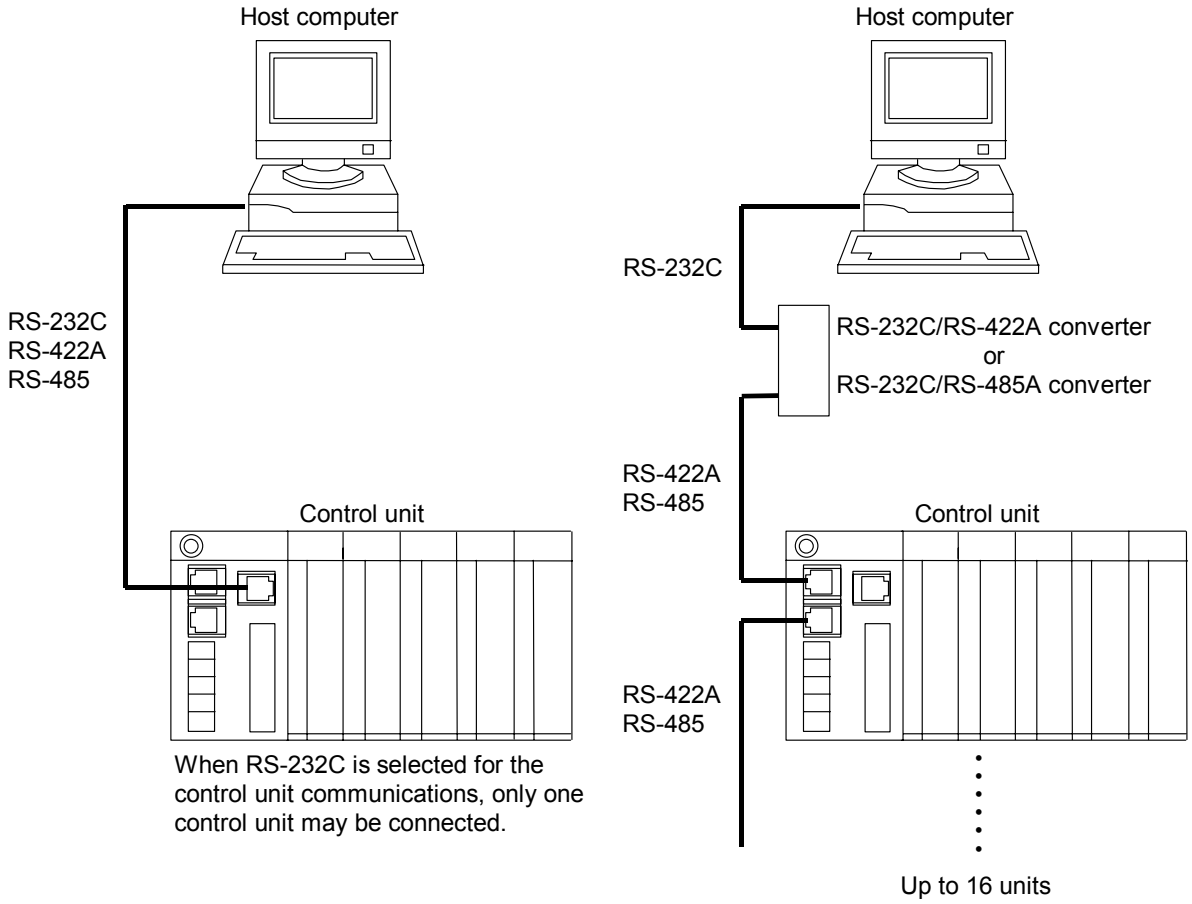

H-PCP-J module
Expansion cable
AY1584□
(Manufactured by Matsushita Electric Works, Ltd.)
Connector terminal
CT1-20
(Manufactured by Matsushita Electric Works, Ltd.)
B1 B2 B3 B4 B5 B6 B7 B8 B9 B10
A1 A2 A3 A4 A5 A6 A7 A8 A9 A10
: Unused
B1 B2 B3 B4 B5 B6 B7 B8 B9 B10
A1 A2
12 to 24 V DC
DO8 DO7 DO6 DO5 DO4 DO3 DO2 DO1

4.2.2 Connection to the host computer

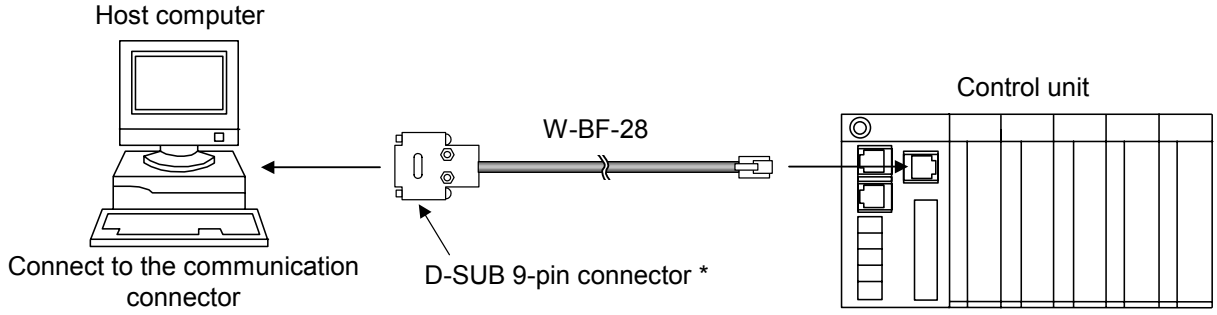
■ Connection block diagram

The communication interface for control unit are RS-232C *, RS-422A and RS-485. When using the RS-422A or RS-485, a maximum of 16 control units can be connected. However, when connecting to the computer which only has a RS-232C driver, RS-232C/RS-422A converter or RS-232C/RS-485 converter will be necessary.

* RS-232C can be selected only COM. PORT3.



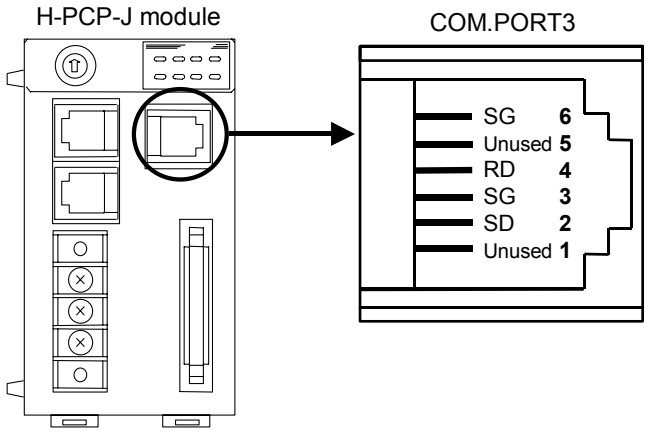
■ RS-232C



* Use D-SUB 25-pin modular conversion connector (Recommended type: TM12RV-64-H manufactured by HIROSE ELECTRIC CO., LTD.) when connector of host computer is D-SUB 25-pin.

Cable type: W-BF-28-3000 (RKC product, Sold separately)
[Standard cable length: 3 m]

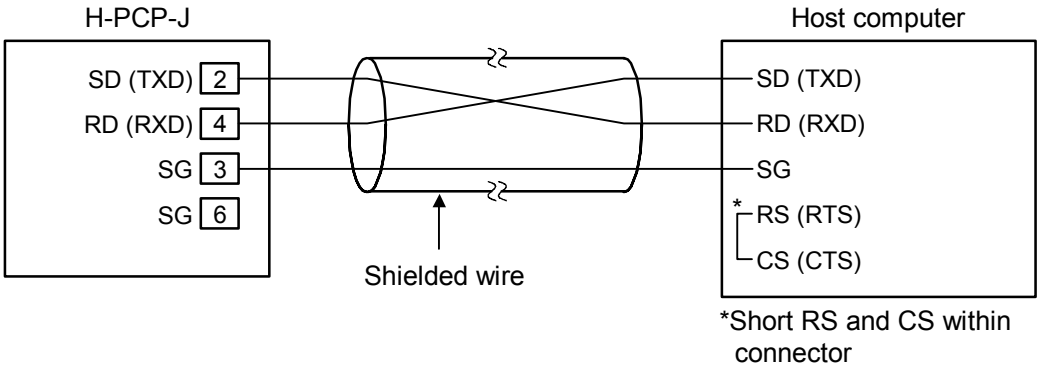
● Pin layout of modular connector (RS-232C)



● Connector pin number and signal details (RS-232C)

Pin No.	Signal name	Symbol
1	Unused	—
2	Send data	SD (TXD)
3	Signal ground	SG
4	Receive data	RD (RXD)
5	Unused	—
6	Signal ground	SG

- **Diagram of RS-232C wiring**

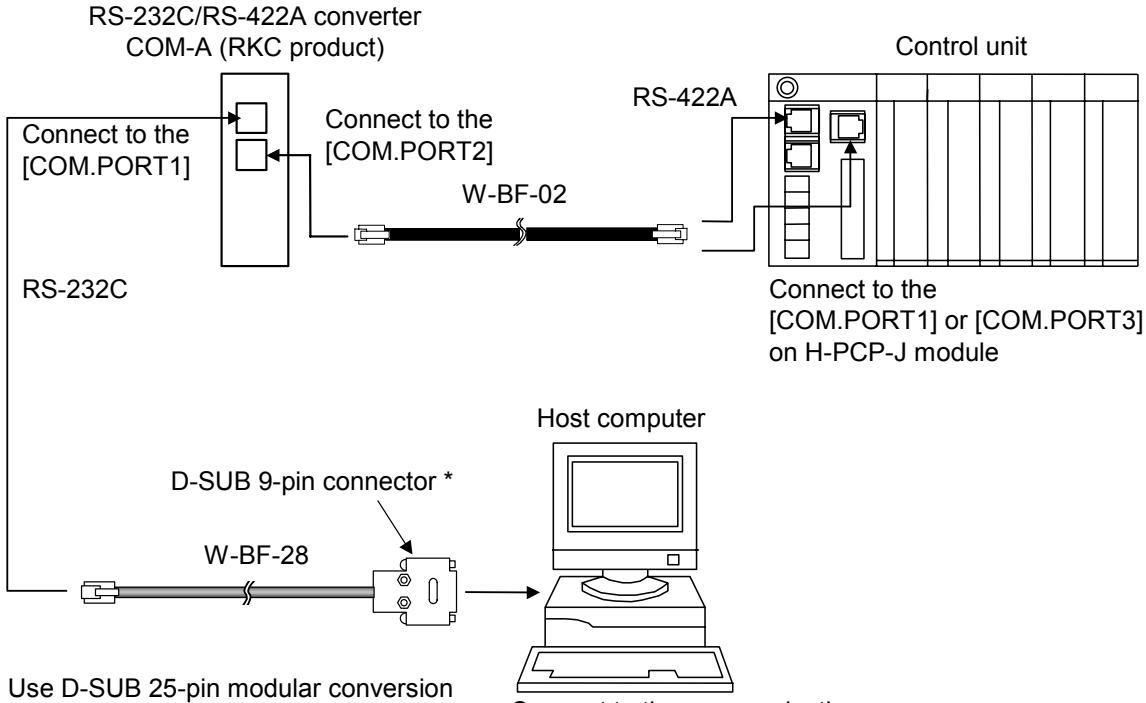


Customer is requested to prepare a communication cable fit for the control unit to be connected by the host computer. Connection cable W-BF-02 * and W-BF-28 * (RKC product) can use to connect host computer.

* Shields of the cable are connected to SG (No. 6 pin) of the H-PCP-J connector.

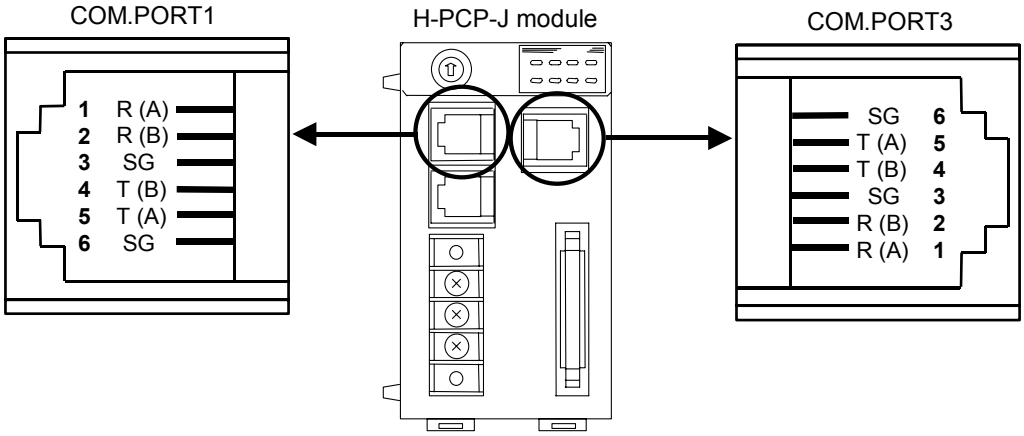
The 6-pin type modular connector should be used for the connection to the H-PCP-J module. Recommended model: TM4P-66P (Manufactured by HIROSE ELECTRIC CO., LTD.)

■ RS-422A



Recommended RS-232C/RS-422A converter: **COM-A** (RKC product)
For the COM-A, see the **COM-A/COM-B Instruction Manual (IMSRM33-E□)**.

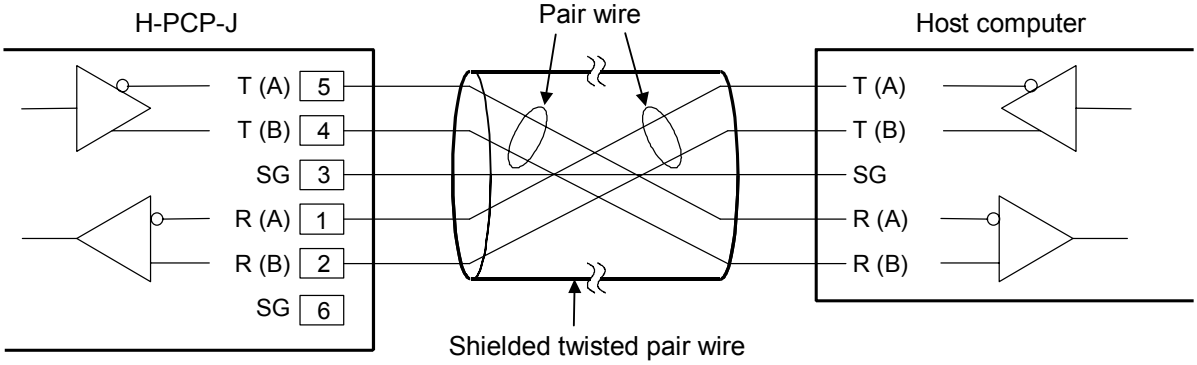
- **Pin layout of modular connector (RS-422A)**



- **Connector pin number and signal details (RS-422A)**

Pin No.	Signal name	Symbol
1	Receive data	R (A)
2	Receive data	R (B)
3	Signal ground	SG
4	Send data	T (B)
5	Send data	T (A)
6	Signal ground	SG

- **Diagram of RS-422A wiring**

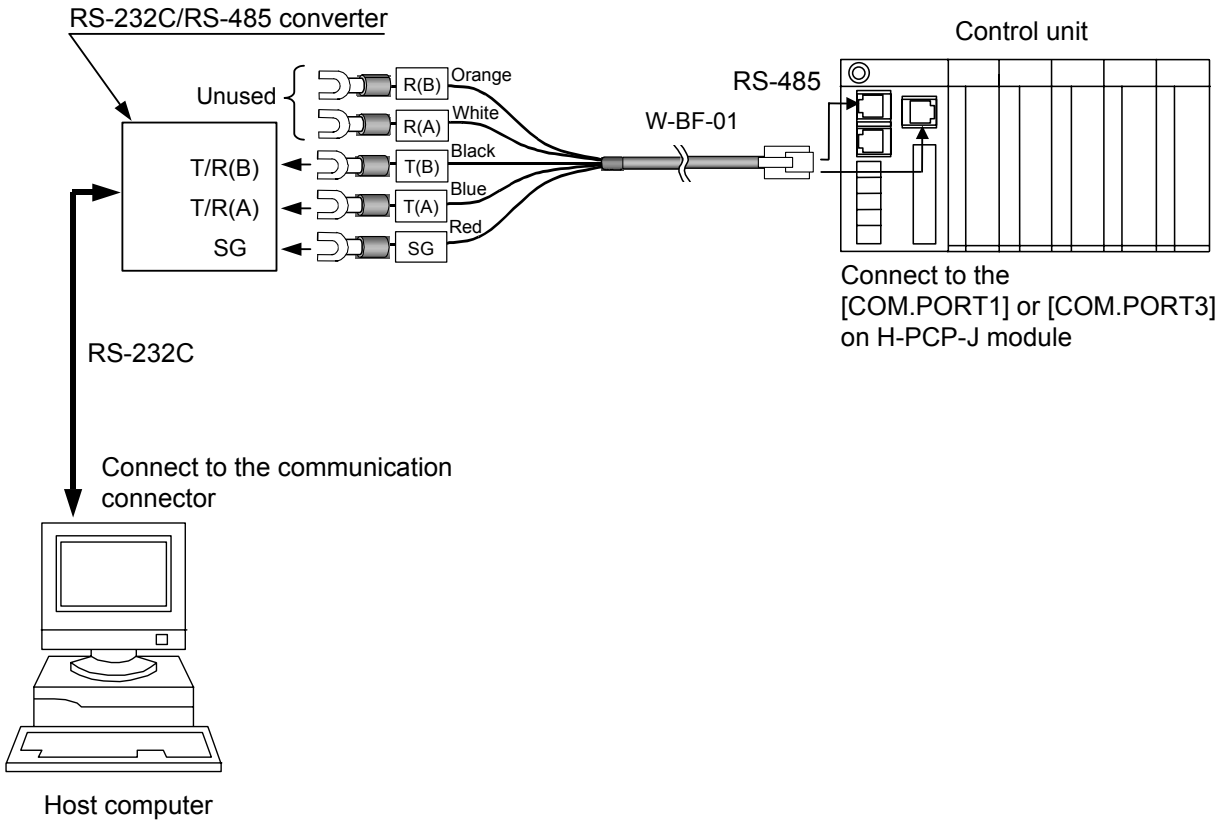


Customer is requested to prepare a communication cable fit for the control unit to be connected by the host computer. Connection cable W-BF-02 * and W-BF-28 * (RKC product) can use to connect host computer.

* Shields of the cable are connected to SG (No. 6 pin) of the H-PCP-J connector.

The 6-pin type modular connector should be used for the connection to the H-PCP-J module. Recommended model: TM4P-66P (Manufactured by HIROSE ELECTRIC CO., LTD.)

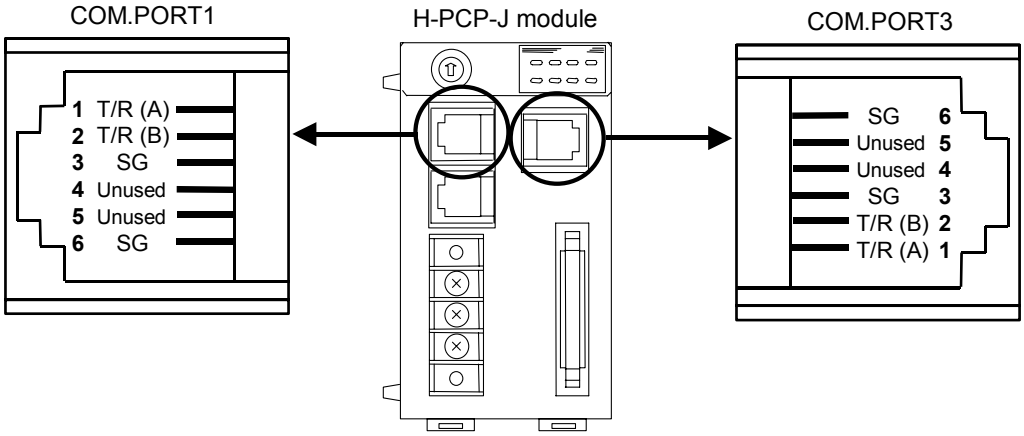
■ RS-485



Cable type: W-BF-01-3000 (RKC product, Sold separately) [Standard cable length: 3 m]

When the host computer (master) uses Windows 95/98/NT, use a RS-232C/RS-485 converter with an automatic send/receive transfer function.
Recommended: CD485, CD485/V manufactured by Data Link, Inc. or equivalent.

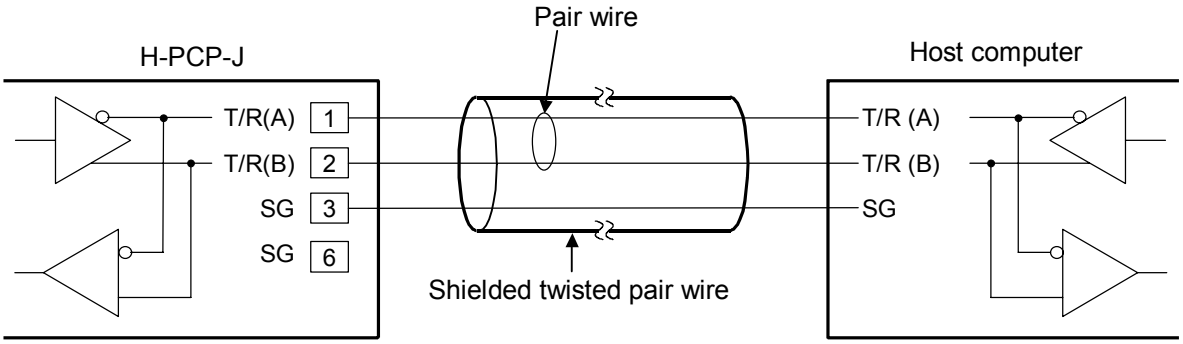
- **Pin layout of modular connector (RS-485)**



- **Connector pin number and signal details (RS-485)**

Pin No.	Signal name	Symbol
1	Send/receive data	T/R (A)
2	Send/receive data	T/R (B)
3	Signal ground	SG
4	Unused	−
5	Unused	−
6	Signal ground	SG

- **Diagram of RS-485 wiring**



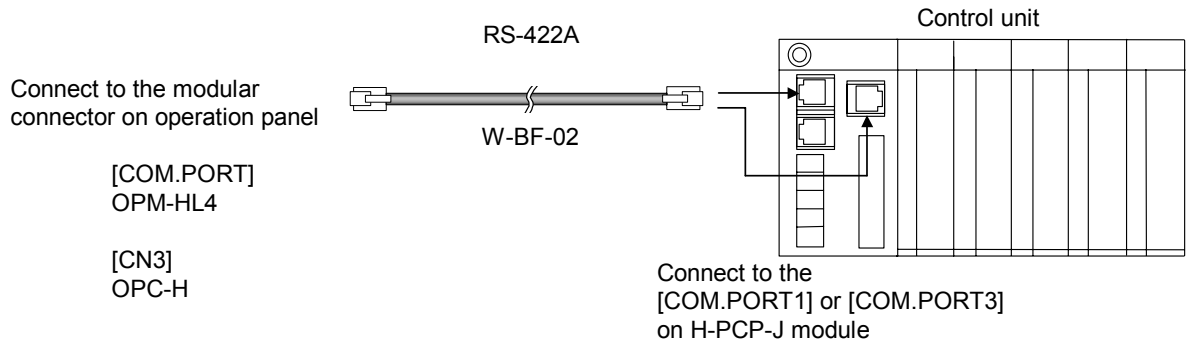
Customer is requested to prepare a communication cable fit for the control unit to be connected by the host computer. Connection cable W-BF-01 * (RKC product) can use to connect host computer.

* Shields of the cable are connected to SG (No. 6 pin) of the H-PCP-J connector.

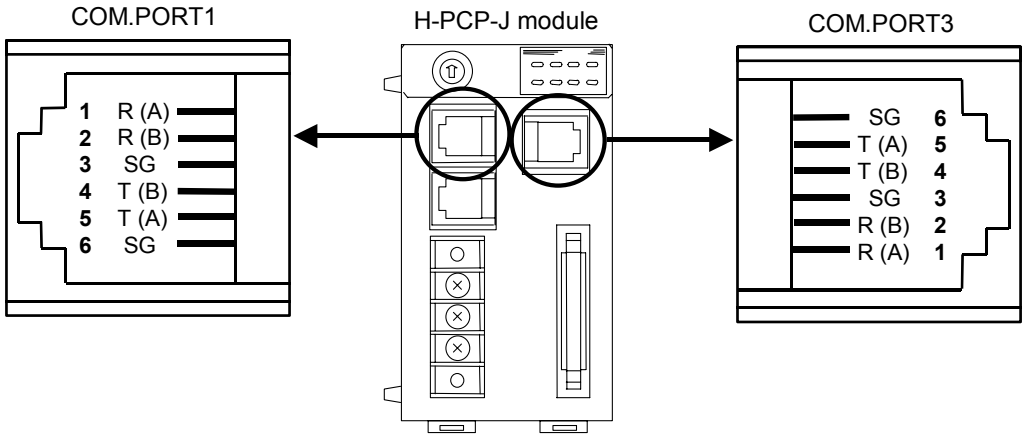
The 6-pin type modular connector should be used for the connection to the H-PCP-J module. Recommended model: TM4P-66P (Manufactured by HIROSE ELECTRIC CO., LTD.)

4.2.3 Connection to the operation panel

For the connection cable, use the RKC product (Sold separately).
Cable type: W-BF-02-3000 [Standard cable length: 3 m]



- **Pin layout of modular connector (RS-422A)**



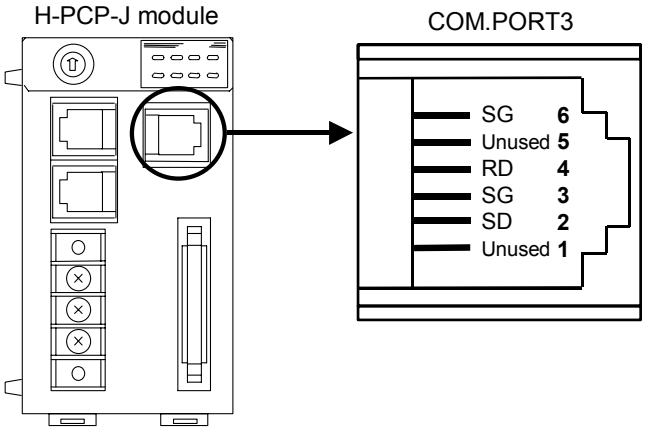
- **Connector pin number and signal details (RS-422A)**

Pin No.	Signal name	Symbol
1	Receive data	R (A)
2	Receive data	R (B)
3	Signal ground	SG
4	Send data	T (B)
5	Send data	T (A)
6	Signal ground	SG

4.2.4 Connection to the touch panel

■ RS-232C

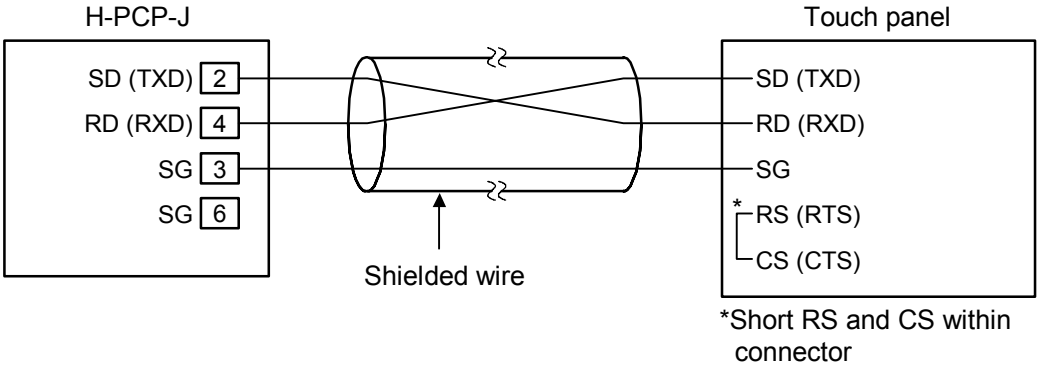
- **Pin layout of modular connector (RS-232C)**



- **Connector pin number and signal details (RS-232C)**

Pin No.	Signal name	Symbol
1	Unused	–
2	Send data	SD (TXD)
3	Signal ground	SG
4	Receive data	RD (RXD)
5	Unused	–
6	Signal ground	SG

- **Diagram of RS-232C wiring**

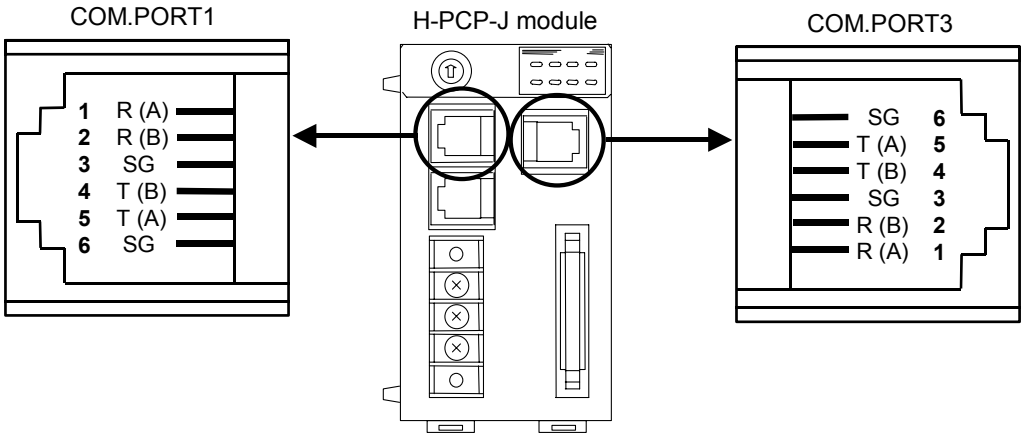


Customer is requested to prepare a communication cable fit for the control unit to be connected by the touch panel.

The 6-pin type modular connector should be used for the connection to the H-PCP-J module. Recommended model: TM4P-66P (Manufactured by HIROSE ELECTRIC CO., LTD.)

■ RS-422A

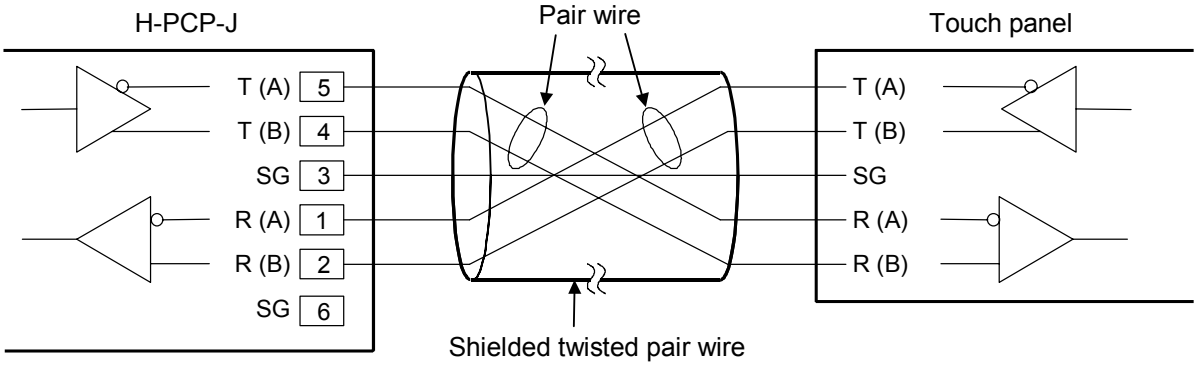
● Pin layout of modular connector (RS-422A)



● Connector pin number and signal details (RS-422A)

Pin No.	Signal name	Symbol
1	Receive data	R (A)
2	Receive data	R (B)
3	Signal ground	SG
4	Send data	T (B)
5	Send data	T (A)
6	Signal ground	SG

● Diagram of RS-422A wiring

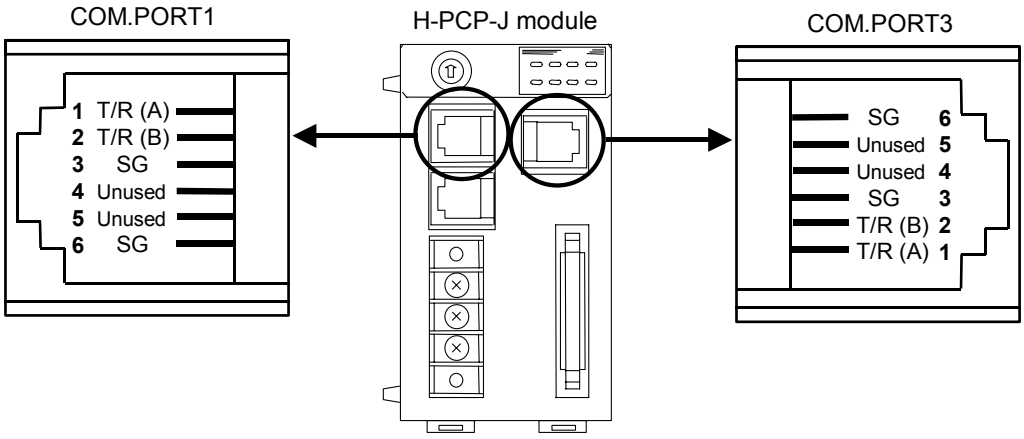


Customer is requested to prepare a communication cable fit for the control unit to be connected by the touch panel.

The 6-pin type modular connector should be used for the connection to the H-PCP-J module. Recommended model: TM4P-66P (Manufactured by HIROSE ELECTRIC CO., LTD.)

■ RS-485

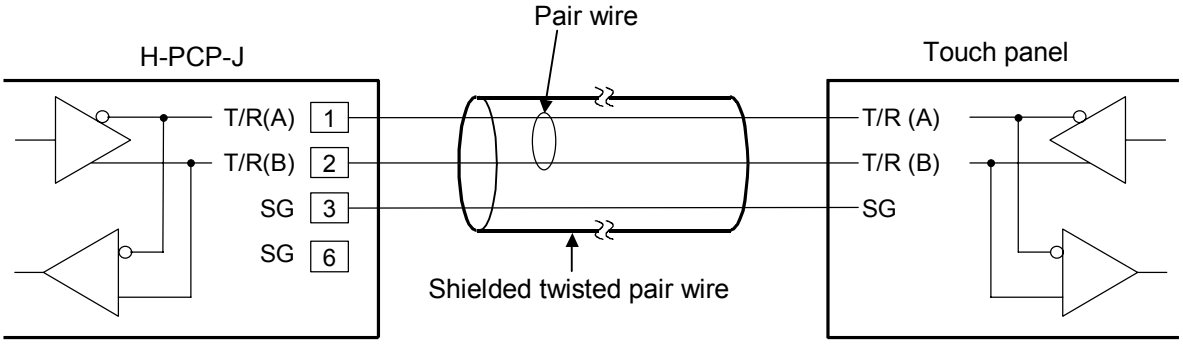
● Pin layout of modular connector (RS-485)



● Connector pin number and signal details (RS-485)

Pin No.	Signal name	Symbol
1	Send/receive data	T/R (A)
2	Send/receive data	T/R (B)
3	Signal ground	SG
4	Unused	—
5	Unused	—
6	Signal ground	SG

● Diagram of RS-485 wiring



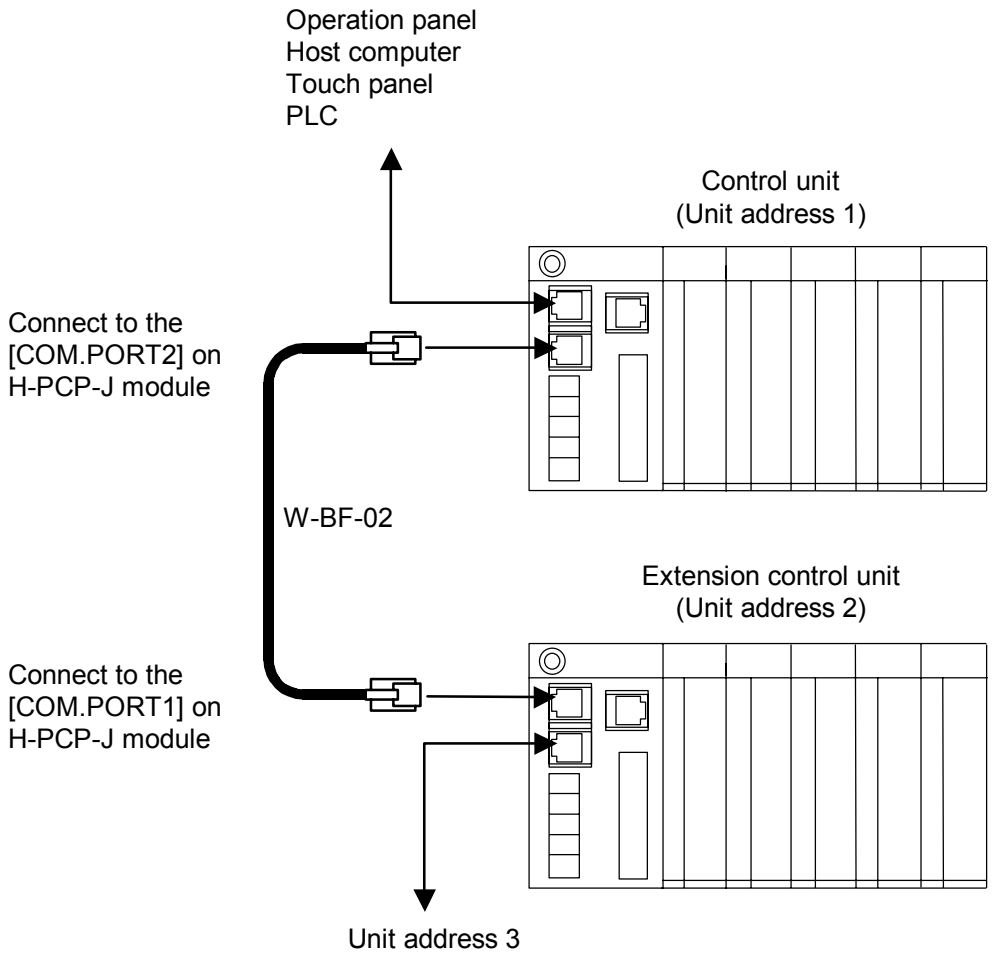
Customer is requested to prepare a communication cable fit for the control unit to be connected by the touch panel.

The 6-pin type modular connector should be used for the connection to the H-PCP-J module. Recommended model: TM4P-66P (Manufactured by HIROSE ELECTRIC CO., LTD.)

4.2.5 Multiple control unit connections

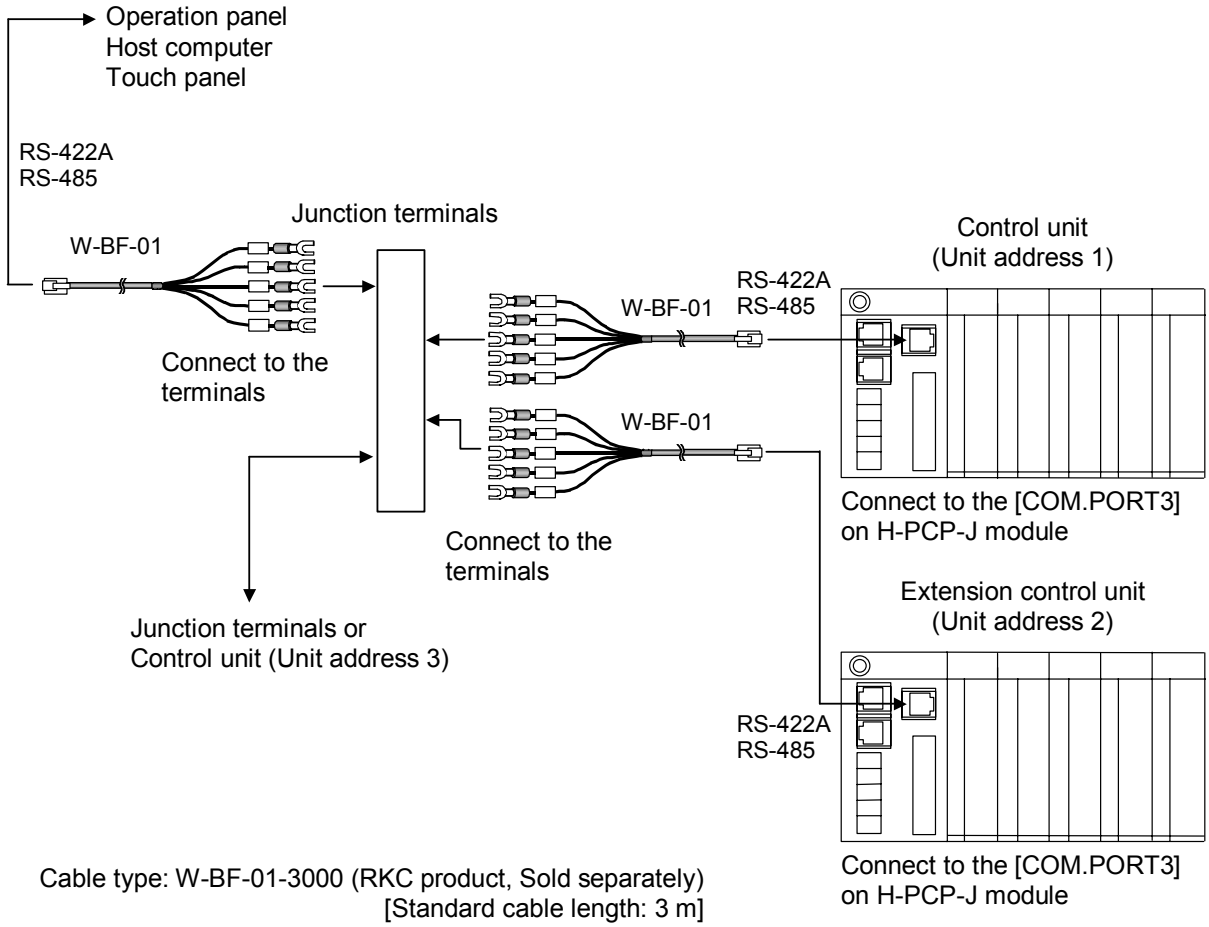
■ When using COM.PORT1 and COM.PORT2:

Connect COM.PORT2 on unit address 1 to COM.PORT1 on unit address 2.

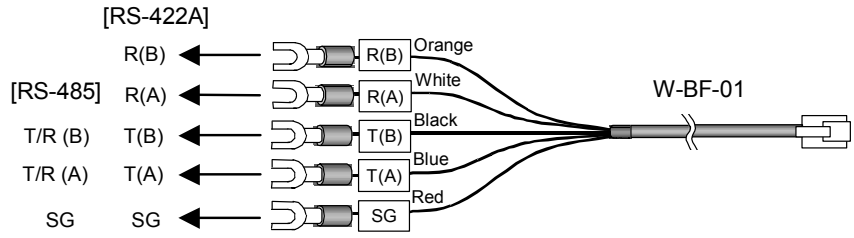


Cable type: W-BF-02-3000 (RKC product, Sold separately) [Standard cable length: 3 m]

■ When using COM.PORT3:



Cable type: W-BF-01-3000 (RKC product, Sold separately)
[Standard cable length: 3 m]



Connect according to the label names as they are without crossing the wires.
In case of RS-485 interface, be sure to insulate the terminals that are not used by covering them with insulating tape.

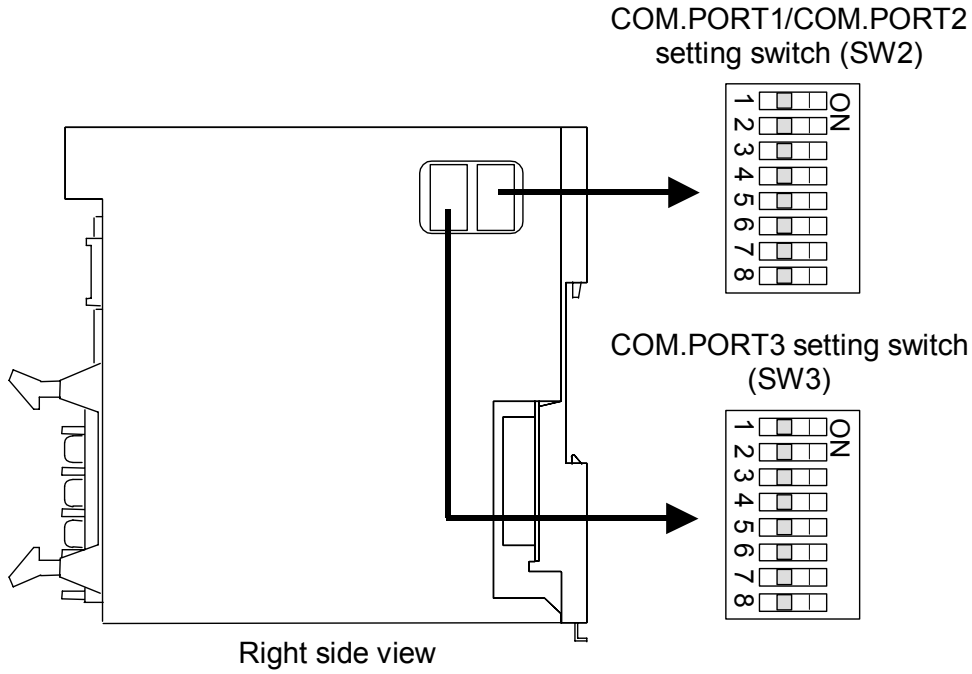
5. SETTINGS BEFORE OPERATION

5.1 Protocol Selection and Host Communication Setting

⚠ WARNING

- To prevent electric shock or instrument failure, always turn off the power before setting the switch.
- To prevent electric shock or instrument failure, never touch any section other than those instructed in this manual.

Protocol, data bit configuration, communication speed and initialize method can be set with the dip switches located in the H-PCP-J module.



- **COM.PORT1/COM.PORT2 setting switch (SW2)**

SW2		Data bit configuration
1	2	
OFF	OFF	Data 8-bit, Without parity, Stop 1-bit
ON	OFF	Data 7-bit, Odd parity, Stop 1-bit
OFF	ON	Data 7-bit, Even parity, Stop 1-bit
ON	ON	Data 7-bit, Even parity, Stop 2-bit

Factory set value: Data 8-bit, Without parity, Stop 1-bit

SW2		Communication speed
3	4	
OFF	OFF	9600 bps
ON	OFF	19200 bps
OFF	ON	38400 bps
ON	ON	Do not set this one

Factory set value: 9600 bps

Continued on the next page.

COM.PORT1/COM.PORT2 setting switch (SW2)

SW2				Protocol
5	6	7	8	
OFF	OFF	OFF	OFF	RKC communication protocol (Based on ANSI X3.28 subcategory 2.5 B1) ☞ See **6. RKC COMMUNICATION (P. 52)**.
ON	OFF	OFF	OFF	Modbus protocol ☞ See **7. MODBUS (P. 109)**.
OFF	ON	OFF	OFF	MITSUBISHI MELSEC series special protocol AnA/AnUCPU common command (QW/QR) ☞ See **PLC Communication Instruction Manual [For MITSUBISHI PLC] (IMS01J03-E□)**.
ON	ON	OFF	OFF	MITSUBISHI MELSEC series special protocol ACPU common command (WW/WR) ☞ See **PLC Communication Instruction Manual [For MITSUBISHI PLC] (IMS01J03-E□)**.
OFF	OFF	ON	OFF	MITSUBISHI MELSEC series special protocol AnA/AnUCPU common command (QW/QR) [Current transformer (CT) monitor] * ☞ See **PLC Communication Instruction Manual [For MITSUBISHI PLC] (IMS01J03-E□)**.
ON	OFF	ON	OFF	OMRON SYSMAC series special protocol ☞ See **PLC Communication Instruction Manual [For OMRON PLC] (IMS01J04-E□)**.
OFF	ON	ON	OFF	OMRON SYSMAC series special protocol [Current transformer (CT) monitor] * ☞ See **PLC Communication Instruction Manual [For OMRON PLC] (IMS01J04-E□)**.
ON	ON	ON	OFF	SHARP JW50H/70H/100H and JW30H special protocol Computer link (command mode) ☞ See **PLC Communication Instruction Manual [For SHARP PLC] (IMS01J05-E□)**.
OFF	OFF	OFF	ON	Do not set this one
ON	OFF	OFF	ON	
OFF	ON	OFF	ON	LG MASTER-K series special protocol ☞ See **PLC Communication Instruction Manual [For LG PLC] (IMS01J06-E□)**.
ON	ON	OFF	ON	LG GLOFA-GM series special protocol ☞ See **PLC Communication Instruction Manual [For LG PLC] (IMS01J06-E□)**.
OFF	OFF	ON	ON	Do not set this one
ON	OFF	ON	ON	
OFF	ON	ON	ON	
ON	ON	ON	ON	

Factory set value: RKC communication protocol

* This is the dedicated to current transformer (CT) monitor. This protocol cannot be used together with other protocols on the same line.

- **COM.PORT3 setting switch (SW3)**

SW3		Data bit configuration
1	2	
OFF	OFF	Data 8-bit, Without parity, Stop 1-bit
ON	OFF	Data 7-bit, Odd parity, Stop 1-bit
OFF	ON	Data 7-bit, Even parity, Stop 1-bit
ON	ON	Data 7-bit, Even parity, Stop 2-bit

Factory set value: Data 8-bit, Without parity, Stop 1-bit

SW3		Communication speed
3	4	
OFF	OFF	9600 bps
ON	OFF	19200 bps
OFF	ON	38400 bps
ON	ON	Don't set this one

Factory set value: 9600 bps

SW3	Protocol
5	
OFF	RKC communication protocol (Based on ANSI X3.28 subcategory 2.5 B1) ☞ See **6. RKC COMMUNICATION (P. 52)**.
ON	Modbus protocol ☞ See **7. MODBUS (P. 109)**.

Factory set value: RKC communication protocol

SW3	Initialize
6	
OFF	Normal (It is initialized only in initialization execution)
ON	In power on, all module is initialized

Factory set value: Normal (It is initialized only in initialization execution)

Continued on the next page.

COM.PORT3 setting switch (SW3)

SW3 7	Modbus mode selection
OFF	Modbus mode 1 (Data time interval judges time-out with 24-bit time or more.) This mode is based on Modbus RTU standard.
ON	Modbus mode 2 (Data time interval judges time-out with 24-bit time + 2 ms or more.) As time intervals between each data configuring one message become longer than the 24-bit time when sending a command message from the master, it is set when the slave does not make a response. (When MONITOUCH V6 series manufactured by Hakko Electronics Co., Ltd. is used.)

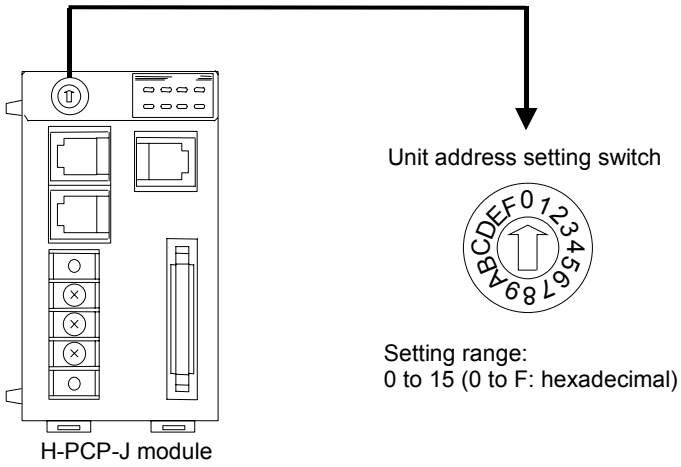
Factory set value: Modbus mode 1

The setting of Modbus mode selection is valid for the communication ports of COM.PORT1/COM.PORT2 and COM.PORT3. However, the setting of COM.PORT3 setting switch (SW3) No.7 is invalid for any communication ports which select protocols other than the Modbus protocol.

Always do not change the COM.PORT3 setting switch (SW3) No. 8.

5.2 Unit Address Setting

When each control unit is multi-drop connected to host computer, set the unit address of each control unit using the unit address setting switch at the front of the H-PCP-J module. For this setting, use a small blade screwdriver.



Set the unit address such that it is different to the other addresses on the same line. Otherwise, problems or malfunction may result.

5.3 Start-up Procedures

■ Check prior to power on

Check the following items before turning on the power to the control unit.

- Operation environments conform to **3.1 Mounting Cautions (P. 20)**.
- Wiring and connections conform to **4. WIRING (P. 25)**.
- Power supply voltage conforms to **2. SPECIFICATIONS (P. 14)**.

■ Check after power on

Check that the RUN lamps on the H-PCP-J and function modules are flashing.

■ Operation after power on

Action after power on differs depending on control RUN/STOP holding (Identifier X1) setting.

Control RUN/STOP holding (Identifier X1)	Status after power-ON	
	Operation mode	Control RUN/STOP
0: Not hold	Same as mode before the power failure	"0: Control STOP" Stopped until "1: Control RUN" is instructed from the PLC or host computer.
1: Hold	Same as mode before the power failure	Same as status before the power failure Control before power failure is maintained even if no PLC or host computer is connected.
2: Start-up from control run status	"1: Monitor" mode However if the operation mode is set to "0: Unused," "0: Unused" remains unchanged.	"1: Control RUN" However, no control is performed until the operation mode is set to "3: Normal (perform control)."

☞ For the control RUN/STOP holding (Identifier X1), see the **6.3 Initial Settings (P. 81)**.

5.4 Communication Requirements

■ Processing times during data send/receive

The SR Mini HG SYSTEM requires the following processing times during data send/receive.
Whether the host computer is using either the polling or selecting procedure for communication, the following processing times are required for SR Mini HG SYSTEM to send data:

-Response wait time after SR Mini HG SYSTEM sends BCC in polling procedure
-Response wait time after SR Mini HG SYSTEM sends ACK or NAK in selecting procedure

RKC communication (Polling procedure)

Procedure details	Time (ms)		
	MIN	TYP	MAX
Response send time after SR Mini HG SYSTEM receives ENQ	4	7	20
Response send time after SR Mini HG SYSTEM receives ACK	4	–	20
Response send time after SR Mini HG SYSTEM receives NAK	4	–	20
Response wait time after SR Mini HG SYSTEM sends BCC	–	–	1.0

RKC communication (Selecting procedure)

Procedure details	Time (ms)		
	MIN	TYP	MAX
Response send time after SR Mini HG SYSTEM receives BCC	4	7	20
Response wait time after SR Mini HG SYSTEM sends ACK	–	–	1.0
Response wait time after SR Mini HG SYSTEM sends NAK	–	–	1.0

Modbus

Procedure details	Time
Read holding registers [03H] Response transmission time after the slave receives the query message	20 ms max.
Preset single register [06H] Response transmission time after the slave receives the query message	10 ms max.
Diagnostics (loopback test) [08H] Response transmission time after the slave receives the query message	10 ms max.
Preset multiple register [10H] Response transmission time after the slave receives the query message	40 ms max.

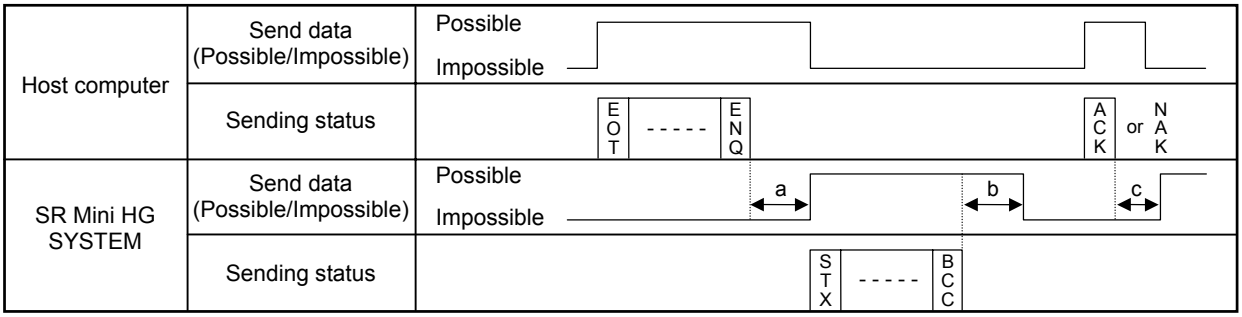
Only 1 port uses communication port, and response send time is time at having set interval time in 0 ms. In addition, in status of the following, there is not communication between a little.

- AT end: About 0.8 seconds
- Setting of initial setting item: About 0.8 to 3 seconds

■ RS-485 (2-wire system) send/receive timing

The sending and receiving of RS-485 communication is conducted through two wires; consequently, the transmission and reception of data requires precise timing. Typical polling and selecting procedures between the host computer and SR Mini HG SYSTEM are described below:

● Polling procedure

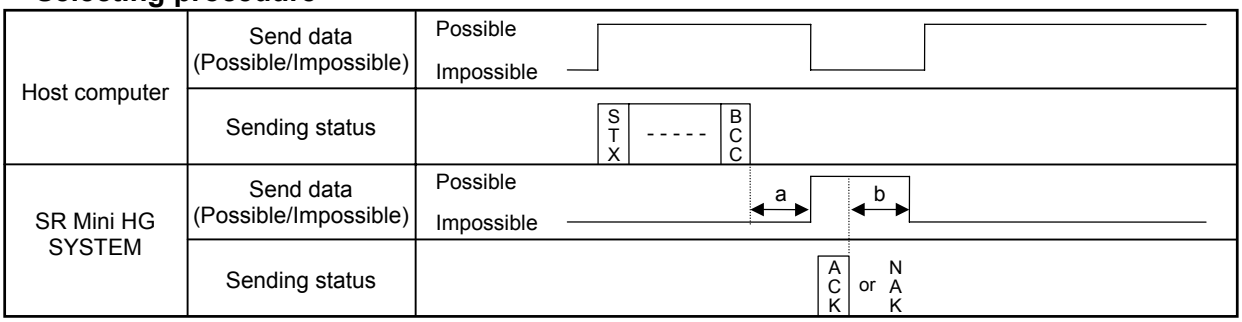


a: Response send time after SR Mini HG SYSTEM receives [ENQ] + Interval time

b: Response wait time after SR Mini HG SYSTEM sends BCC

c: Response send time after SR Mini HG SYSTEM receives [ACK] + Interval time or
Response send time after SR Mini HG SYSTEM receives [NAK] + Interval time

● Selecting procedure



a: Response send time after SR Mini HG SYSTEM receives BCC + Interval time

b: Response wait time after SR Mini HG SYSTEM sends ACK or
Response wait time after SR Mini HG SYSTEM sends NAK

To switch the host computer from transmission to reception, send data must be on line. To check if data is on line, do not use the host computer's transmission buffer but confirm it by the shift register.

Whether the host computer is using either the polling or selecting procedure for communication, the following processing times are required for SR Mini HG SYSTEM to send data:

-Response wait time after SR Mini HG SYSTEM sends BCC in polling procedure

-Response wait time after SR Mini HG SYSTEM sends ACK or NAK in selecting procedure

■ Fail-safe

A transmission error may occur with the transmission line disconnected, shorted or set to the high-impedance state. In order to prevent the above error, it is recommended that the fail-safe function be provided on the receiver side of the host computer. The fail-safe function can prevent a framing error from its occurrence by making the receiver output stable to the MARK (1) when the transmission line is in the high-impedance state.

6. RKC COMMUNICATION

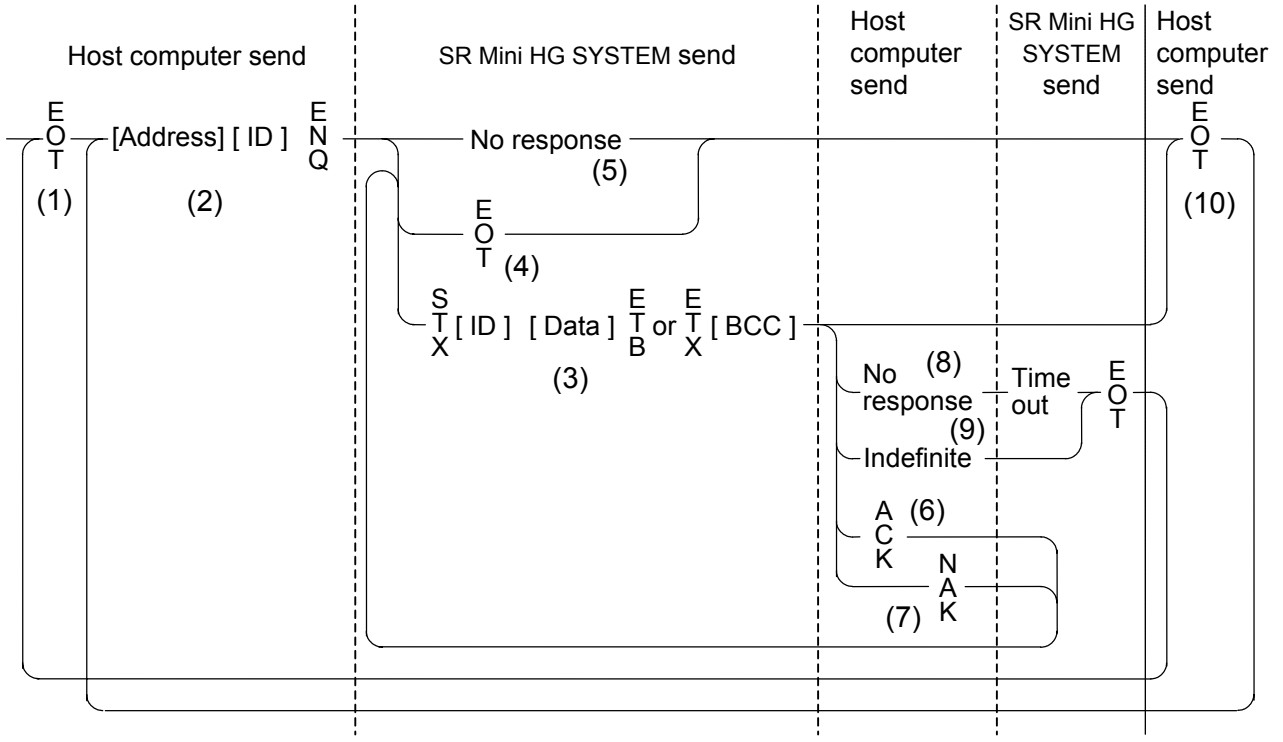
6.1 Protocol

RKC communication uses the polling/selecting method to establish a data link. The basic procedure is followed ANSI X3.28 subcategory 2.5, B1 basic mode data transmission control procedure (Fast selecting is the selecting method used in SR Mini HG SYSTEM).

- The polling/selecting procedures are a centralized control method where the host computer controls the entire process. The host computer initiates all communication so the controller responds according to queries and commands from the host.
- The code use in communication is 7-bit ASCII code including transmission control characters.
  Transmission control characters used in SR Mini HG SYSTEM:
  EOT (04H), ENQ (05H), ACK (06H), NAK (15H), STX (02H), ETB (17H), ETX (03H)
  ( ): Hexadecimal

6.1.1 Polling

Polling is the action where the host computer requests one of the connected SR Mini HG SYSTEM to transmit data. An example of the polling procedure is shown below:



ID: Identifier

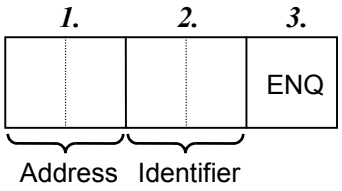
■ Polling procedures

(1) Data link initialization

Host computer sends EOT to the controllers to initiate data link before polling sequence.

(2) Data sent from host computer - Polling sequence

Host computer sends polling sequence with the format shown below:



Example:

0	2	M	1	ENQ

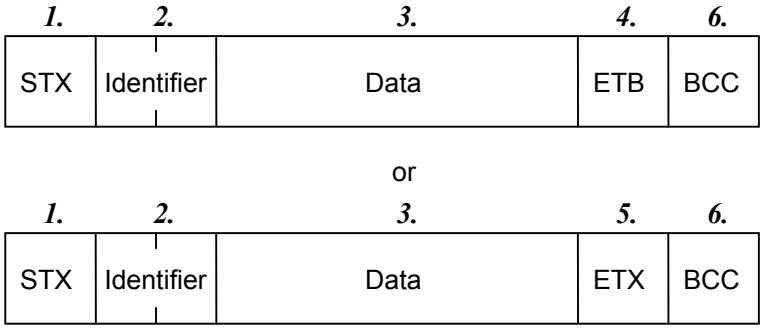
1. Address (2 digits)
This data is a unit address of the SR Mini HG SYSTEM for polled and must be the same as the unit address set value in item **5.2 Unit Address Setting (P. 48).**

2. Identifier (2 digits)
The identifier specifies the type of data that is requested from the SR Mini HG SYSTEM. Always attach the ENQ code to the end of the identifier.
☞ See **6.2 Communication Identifier List (P. 65)**.

3. ENQ
The ENQ is the transmission control character that indicates the end of the polling sequence. The host computer then must wait for a response from the SR Mini HG SYSTEM.

(3) Data sent from the SR Mini HG SYSTEM

If the polling sequence is received correctly, the SR Mini HG SYSTEM sends data in the following format:



🕮 If the length of send data (from STX to BCC) exceeds 128 bytes, it is divided into blocks by ETB. In this case, the succeeding divided data is sent after STX.

1. STX
STX is the transmission control character which indicates the start of the text transmission (identifier and data).

2. Identifier (2 digits)
The identifier indicates the type of data (measured value, status and set value) sent to the host computer.
☞ See **6.2 Communication Identifier List (P. 65)**.

3. Data
Data which is indicated by an identifier of this instrument, consisting of channel numbers, data, etc. Each channel number and data are delimited by a space (20H). The data and the next channel number are delimited by a comma.

- Channel number: 2-digit ASCII code, not zero-suppressed. Channels without channel numbers may exist depending on the type of identifier.
- Data: ASCII code, zero-suppressed with spaces (20H). The number of digits varies depending on the type of identifier.

4. ETB
Transmission control character indicating the end of the block.

5. ETX
Transmission control character indicating the end of the text.

6. BCC
BCC (Block Check Character) detects error using horizontal parity and is calculated by horizontal parity (even number).

Calculation method of BCC: *Exclusive OR* all data and characters from STX through ETB or ETX, not including STX.

Example:

STX	M	1	0	1			1	5	0	.	0	ETX	BCC
	4DH	31H	30H	31H	20H	20H	31H	35H	30H	2EH	30H	03H	←

Hexadecimal numbers

BCC = 4DH ⊕ 31H ⊕ 30H ⊕ 31H ⊕ 20H ⊕ 20H ⊕ 31H ⊕ 35H ⊕ 30H ⊕ 2EH ⊕ 30H ⊕ 03H = 54H
(⊕: *Exclusive OR*)
Value of BCC becomes 54H

(4) EOT send (Ending data transmission from the SR Mini HG SYSTEM)

In the following cases, the SR Mini HG SYSTEM sends EOT to terminate the data link:

- When the specified identifier is invalid
- When there is an error in the data format
- When all the data has been sent

(5) No response from the SR Mini HG SYSTEM

The SR Mini HG SYSTEM will not respond if the polling address is not received correctly. It may be necessary for the host computer to take corrective action such as a time-out.

(6) ACK (Acknowledgment)

An acknowledgment ACK is sent by the host computer when data received is correct. When the SR Mini HG SYSTEM receives ACK from the host computer, the SR Mini HG SYSTEM will send any remaining data of the next identifier without additional action from the host computer.

☞ For the identifier, see **6.2 Communication Identifier List (P. 65)**.

When host computer determines to terminate the data link, EOT is sent from the host computer.

(7) NAK (Negative acknowledge)

If the host computer does not receive correct data from the SR Mini HG SYSTEM, it sends a negative acknowledgment NAK to the SR Mini HG SYSTEM. The SR Mini HG SYSTEM will re-send the same data when NAK is received. This cycle will go on continuously until either recovery is achieved or the data link is corrected at the host computer.

(8) No response from host computer

When the host computer does not respond within approximately three seconds after the SR Mini HG SYSTEM sends data, the SR Mini HG SYSTEM sends EOT to terminate the data link (time-out time: about 3 seconds).

(9) Indefinite response from host computer

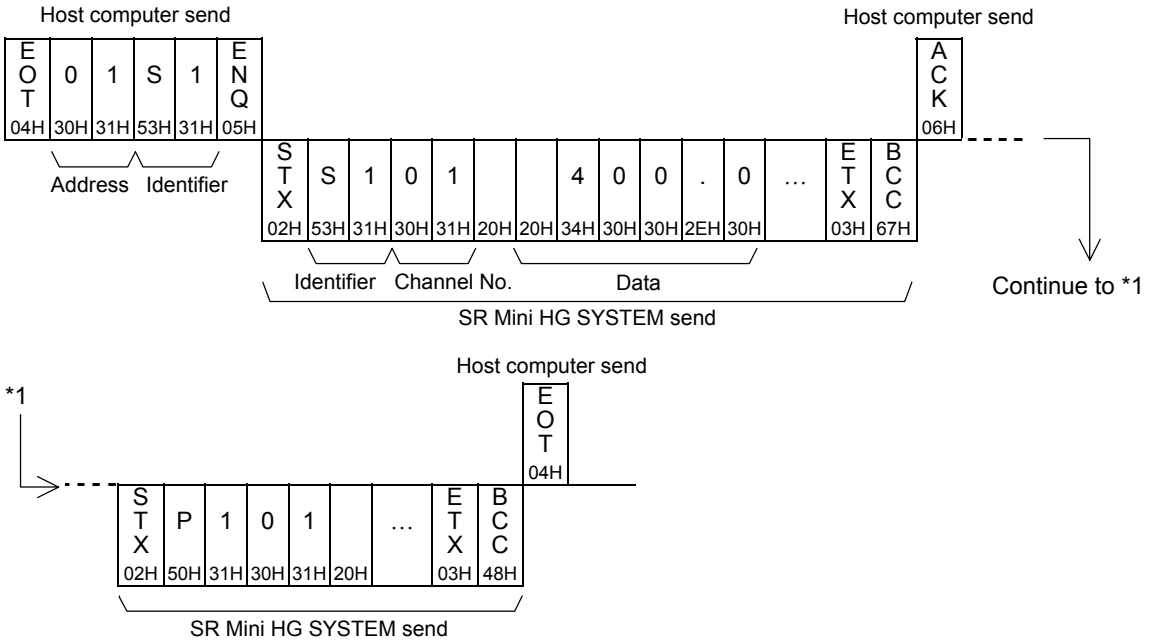
The SR Mini HG SYSTEM sends EOT to terminate the data link when the host computer response is indefinite.

(10) EOT (Data link termination)

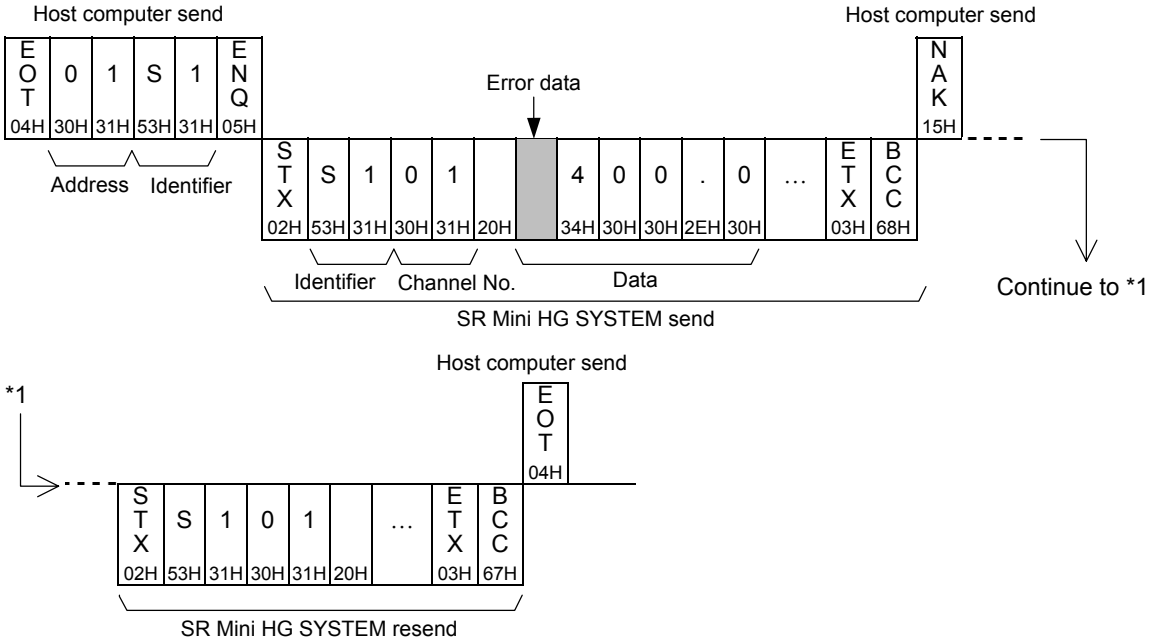
The host computer sends EOT message when it is necessary to suspend communication with the SR Mini HG SYSTEM or to terminate the data link due lack of response from the SR Mini HG SYSTEM.

■ Polling procedure example (When the host computer requests data)

● Normal transmission

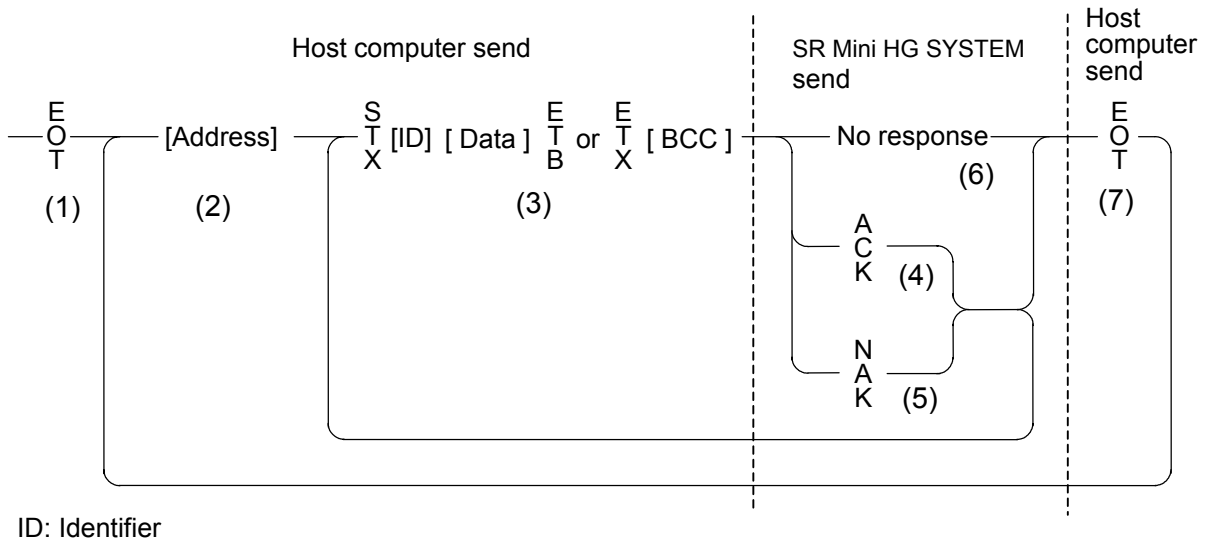


● Error transmission



6.1.2 Selecting

Selecting is the action where the host computer requests one of the connected SR Mini HG SYSTEM to receive data. An example of the selecting procedure is shown below:



ID: Identifier

■ Selecting procedures

(1) Data link initialization

Host computer sends EOT to the SR Mini HG SYSTEM to initiate data link before selecting sequence.

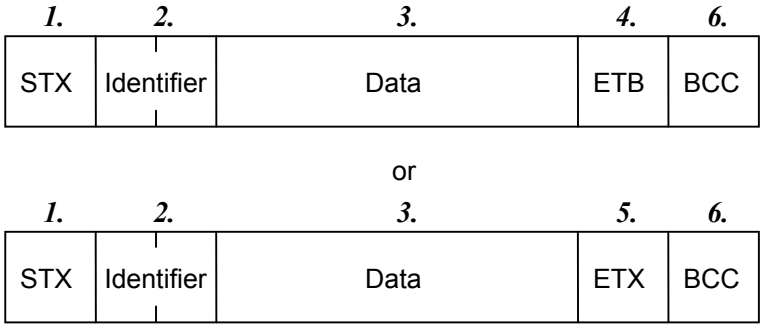
(2) Sending selecting address from the host computer

Host computer sends selecting address for the selecting sequence.

Address (2 digits):
This data is a unit address of the SR Mini HG SYSTEM to be selected and must be the same as the unit address set value in item **5.2 Unit Address Setting (P. 48)**.

(3) Data sent from the host computer

The host computer sends data for the selecting sequence with the following format:



If the length of send data (from STX to BCC) exceeds 128 bytes, it is divided into blocks by ETB. In this case, the succeeding divided data is sent after STX.

Details for *1* to *6*, see **6.1.1 Polling (P. 52)**.

(4) ACK (Acknowledgment)

An acknowledgment ACK is sent by the SR Mini HG SYSTEM when data received is correct. When the host computer receives ACK from the SR Mini HG SYSTEM, the host computer will send any remaining data. If there is no more data to be sent to SR Mini HG SYSTEM, the host computer sends EOT to terminate the data link.

(5) NAK (Negative acknowledge)

If the SR Mini HG SYSTEM does not receive correct data from the host computer, it sends a negative acknowledgment NAK to the host computer. Corrections, such as re-send, must be made at the host computer. The SR Mini HG SYSTEM will send NAK in the following cases:

- When an error occurs on communication the line (parity, framing error, etc.)
- When a BCC check error occurs
- When the specified identifier is invalid
- When receive data exceeds the setting range

(6) No response from SR Mini HG SYSTEM

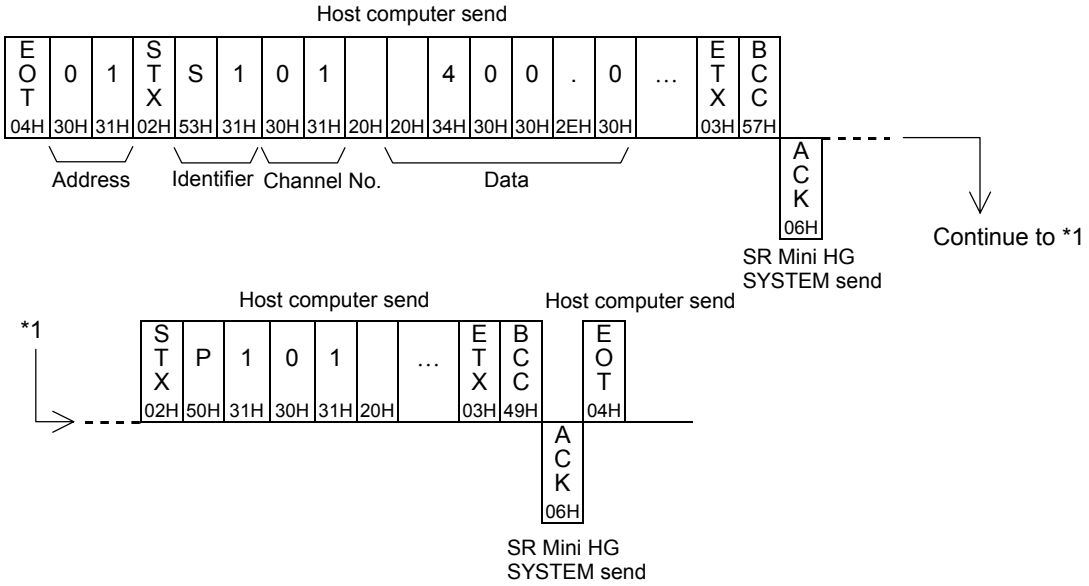
The SR Mini HG SYSTEM does not respond when it can not receive the selecting address, STX, ETB, ETX or BCC.

(7) EOT (Data link termination)

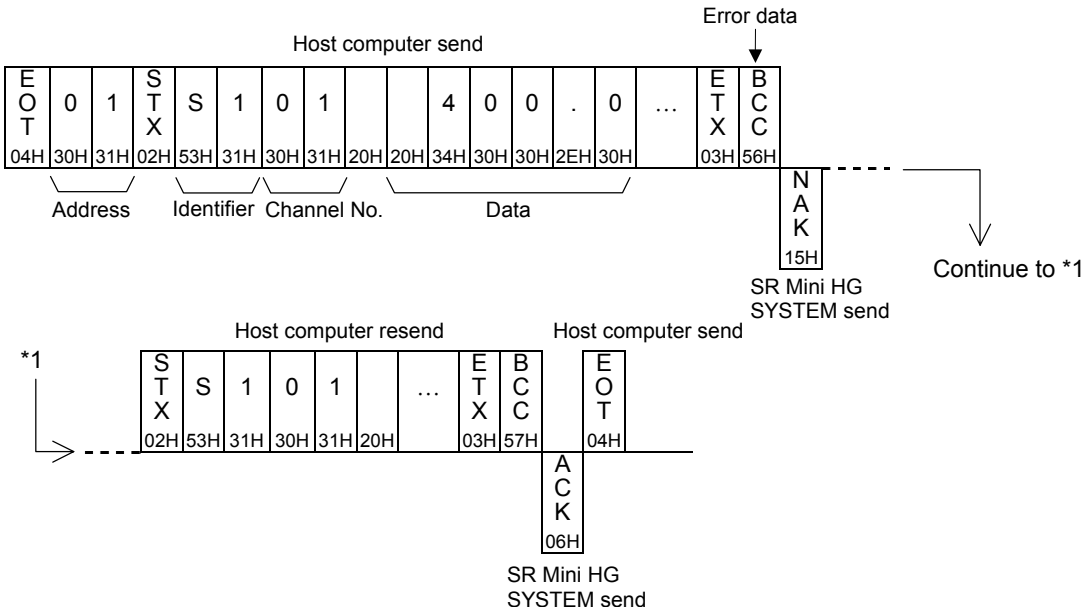
The host computer sends EOT when there is no more data to be sent from the host computer or there is no response from the SR Mini HG SYSTEM.

■ Selecting procedure example (when the host computer sends data)

● Normal transmission

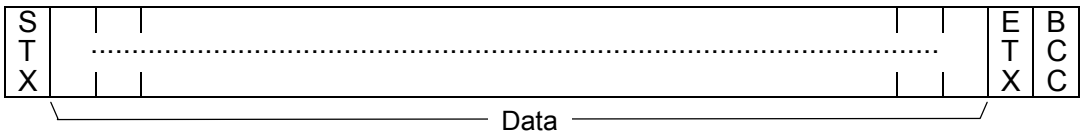


● Error transmission



6.1.3 Communication data structure

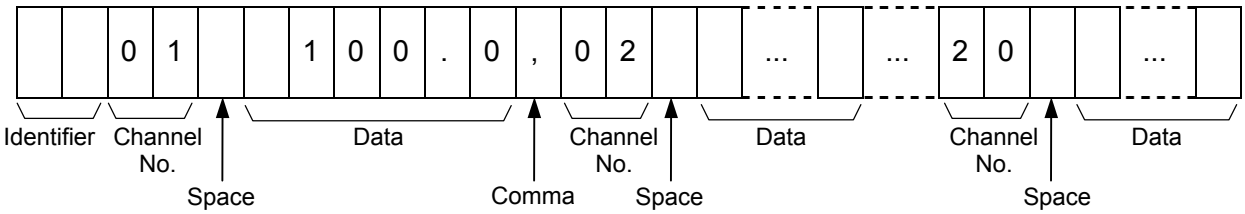
■ Data description (Transmission/receive data structure)



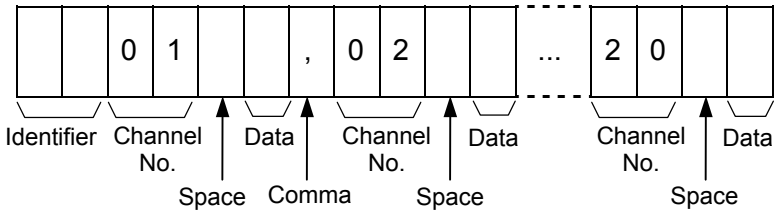
Part of the data above is shown below.

- **Data for each channel**

Data length 6 digits



Data length 1 digit



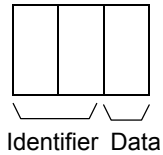
By data structure, channel number becomes as follows:

Data for each module: Module number

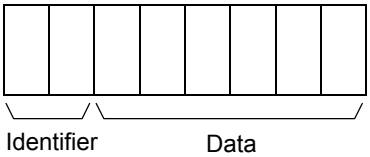
Data for each event input logic circuit: Event input logic circuit number

- **Data for each unit address (Without channel)**

Data length 1 digit



Data length 6 digits



6.1.4 Examples of polling and selecting check programs

The following is the sample program for NEC PC-9800 series computers in BASIC language for carrying out polling and selecting checking by RS-232C specification. There will be some differences in the computer languages according to the type of computer. Before executing the program, confirm that there is no mistake in the wiring of the communications cable and check that the control unit data bit configuration is set to *8* for data bit and *Without* for parity bit. In addition, the communications speed setting should be set to match the host computer speed setting.

■ Example of temperature set values polling check program

```
1000 '---------------------- Identifier setting ----------------------
1010   ID$="S1"                                                          Identifier setting
1020 '
1030 '---------------- Communications initial setting ----------------
1040 CM$="N81NN"                                                         Communications data configuration setting
1050 INPUT "Control unit address=";ADD$                                  Control unit address input
1060 STX$=CHR$(&H2) : EOT$=CHR$(&H4) : ENQ$=CHR$(&H5)                    Communications character setting
1070 ACK$=CHR$(&H6) : NAK$=CHR$(&H15): ETX$=CHR$(&H3)
1080 OPEN "COM1:"+CM$    AS #1                                           Open RS-232C circuit
1090 CONSOLE ,,,1
1100 COLOR 7:CLS 3
1110 '
1120 '------------------- Program main routine ----------------------
1130 *POL
1140      PRINT "                (Polling check)                    "
1150      PRINT "*********Receiving the set values***********"
1160      PRINT "
1170      DT$=EOT$+ADD$+ID$+ENQ$                                         Data configuration setting
1180      GOSUB *TEXT
1190      GOSUB *RXDT
1200 '
1210 *J10
1220      J=0
1230 '
1240 *IF1
1250      IF LOC(1)=0 THEN J=J+1:IF J<500 THEN *IF1 ELSE PRINT "         Setting of the receiving waiting time [1]
TIME OUT ":END                                                           (Timeout processing)
1260 '
1270      K$=INPUT$(1,#1)
1280           IF K$=ETX$ GOTO *ETXRX                                    Communications condition checking
1290           IF K$=NAK$ THEN PRINT "     NAK":END
1300           IF K$=EOT$ THEN PRINT "     EOT":END
1310           IF K$=ACK$ THEN PRINT "     ACK":END
```

[1] Setting of the receiving waiting time:
If time out occurs in using high speed computer (Except no response), the numeral value of *500* in the program should be changed to an appropriately-sized numeral value.

Continued on the next page.

```
1320 '
1330      DT$=DT$+K$
1340      GOTO *J10
1350 '
1360 *ETXRX
1370      DT$=DT$+K$
1380            BCCRX$=INPUT$(1,#1)
1390            BCCRX=ASC(BCCRX$)                    BCC checking
1400            GOSUB *BCCCH
1410      IF BCC<>BCCRX THEN GOSUB *NAKTX
1420      IF BCC<>BCCRX THEN GOSUB *RXDT: GOTO *J10
1430 '
1440      PRINT "Data has been correctly received"   Display of received data and
1450      PRINT "Received data=";DT$ : END           closing of RS-232C circuit
1460 '
1470 '---------- Sub-routine ----------
1480 '
1490 *NAKTX                                          Processing on occurrence of a BCC error
1500      PRINT "BCC error"
1510      DT$=NAK$
1520            GOSUB *TEXT
1530      RETURN
1540 '
1550 *RXDT
1560      DT$=""                                     Clearing of circuit buffer
1570      RETURN
1580 '
1590 *TEXT
1600      PRINT #1,DT$;                              Transfer of polling identifier
1610      RETURN
1620 '
1630 *BCCCH                                          BCC calculation
1640      FOR II=1 TO LEN(DT$)
1650            BCCA$=MID$(DT$,II,1)
1660            IF BCCA$=STX$ THEN BCC=0 : GOTO *IINEXT
1670            BCC=BCC XOR ASC(BCCA$)
1680 *IINEXT
1690      NEXT II
1700      RETURN
```

■ Example of temperature set values selecting checking program

```
1000 '---------- Identifier setting ----------                    Identifier setting
1010   ID$="S1"
1020 '
1030 '---------- Communications initial setting ----------
1040 CM$="N81NN"                                                  Communications data configuration setting
1050 STX$=CHR$(&H2) : EOT$=CHR$(&H4) : ENQ$=CHR$(&H5)             Communications character setting
1060 ACK$=CHR$(&H6) : NAK$=CHR$(&H15): ETX$=CHR$(&H3)
1070 OPEN "COM1:"+CM$    AS #1                                    Opening of RS-232C circuit
1080 CONSOLE ,,,1
1090 COLOR 7:CLS 3
1100 '
1110 '---------- Program main routine ----------
1120 *SEL
1130      PRINT "                    (Selection check)                    "
1140      PRINT "********Transmission of set values*********"
1150      PRINT "
1160      INPUT "Unit No.=";ADD$:INPUT "Channel No.=";C$           Input of the unit and channel number,
          :INPUT "Set value=";S$                                   and the temperature set value
1170      DT$=EOT$+ADD$+STX$+ID$+C$+" "+S$+ETX$                    Data configuration setting 1
1180      PRINT "Transmitting data=";DT$                           Display of transmitting data
1190      GOSUB *BCCCH
1200      DT$=DT$+CHR$(BCC)                                        Data configuration setting 2
1210      GOSUB *TEXT
1220      GOSUB *RXDT
1230 '
1240 *J20
1250      J=0
1260 '
1270 *IF2
1280      IF LOC(1)=0 THEN J=J+1:IF J<500 THEN *IF2 ELSE PRINT "   Setting of the receiving waiting time [1]
          TIME OUT ":END                                           (Timeout processing)
1290 '
1300      K$=INPUT$(1,#1)
1310      IF K$=NAK$ THEN PRINT "      NAK":END                    Communications condition check,
1320      IF K$=ACK$ THEN PRINT "Control unit has received the data"  Display of communication result,
          :END                                                     and closing of RS-232C circuit
1330 '
1340 '
1350 '
```

[1] Setting of the receiving waiting time:
If time out occurs in using high speed computer (Except no response), the numeral value of *500* in the program should be changed to an appropriately-sized numeral value.

Continued on the next page.

```
1360 '---------------------- Sub-routine ----------------------
1370 '
1380 *RXDT'
1390       DT$=""
1400       RETURN                                                  Clearing of circuit buffer
1410 '
1420 *TEXT
1430       PRINT #1,DT$;
1440       RETURN                                                  Transfer of selection data
1450 '
1460 *BCCCH
1470       FOR II=1 TO LEN(DT$)
1480             BCCA$=MID$(DT$,II,1)                              BCC calculation
1490             IF BCCA$=STX$ THEN BCC=0 : GOTO *IINEXT
1500             BCC=BCC XOR ASC(BCCA$)
1510 *IINEXT
1520       NEXT II
1530       RETURN
```

6.2 Communication Identifier List

Note that there are identifiers which indicate that communication is not possible depending on the specification.

- Name
  ◆: Item stored in the memory area.
  [ ]: The functional module name that data becomes valid is written.
- Attributes
  RO: Read only SR Mini HG SYSTEM → Host computer
  R/W: Read and Write SR Mini HG SYSTEM ↔ Host computer
  WO: Write only SR Mini HG SYSTEM ← Host computer
- Structure
  C: Data for each channel L: Data for each event input logic circuit
  M: Data for each module U: Data for each unit address

☞ For the data structure, see the **6.1.3 Communication data structure (P. 60)**.

Data of identifier M1 and identifier S1 with H-TIO-□/H-CIO-A module is different from H-SIO-A module. Data is discriminated by channel number.

Identifier M1: For H-TIO-□/H-CIO-A module..... Temperature measured value (PV)
For H-SIO-A module ..... Motor speed measured value
Identifier S1: For H-TIO-□/H-CIO-A module..... Temperature set value (SV)
For H-SIO-A module ..... Motor speed set value

☞ For the channel number, see the **8.2.9 Assignment of channels (P. 183)**.

Name	Identifier	Digits	Attribute	Structure	Data range	Factory set value
Temperature measured value (PV) [H-TIO-□, H-CIO-A]	**M1**	6	RO	C	TC/RTD input: Within input range Current/voltage input: Within display scale range	—
Motor speed measured value [H-SIO-A]					Within display scale range	—
Alarm 1 status [H-TIO-□, H-CIO-A, H-SIO-A]	**AA**	1	RO	C	0: OFF 1: ON	—
Alarm 2 status [H-TIO-□, H-CIO-A, H-SIO-A]	**AB**	1	RO	C	0: OFF 1: ON	—
Burnout status [H-TIO-□, H-CIO-A, H-SIO-A]	**B1**	1	RO	C	0: OFF 1: ON	—

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Name	Iden-tifier	Digits	Attri-bute	Struc-ture	Data range	Factory set value
Heat-side manipulated output value [H-TIO-□, H-CIO-A]	**O1**	6	RO	C	–5.0 to +105.0 %	—
Cool-side manipulated output value [H-TIO-□, H-CIO-A]	**O2**	6	RO	C	–5.0 to +105.0 %	—
Heater break alarm status [H-TIO-A/C/D, H-CIO-A]	**AC**	1	RO	C	0: OFF 1: ON	—
Current transformer input measured value 1 [H-TIO-A/C/D]	**M3**	6	RO	C	0.0 to 100.0 A or 0.0 to 30.0 A Current transformer (CT) input measured value of the H-TIO-A/C/D module.	—
Current transformer input measured value 2 [H-CT-A]	**M4**	6	RO	C	0.0 to 100.0 A or 0.0 to 30.0 A Current transformer (CT) input measured value of the H-CT-A module.	—
Set value monitor [H-TIO-□, H-CIO-A, H-SIO-A]	**MS**	6	RO	C	TC/RTD input: Within input range Current/voltage input, H-SIO-A: Within display scale range	—
Temperature rise completion status [H-TIO-□, H-CIO-A]	**HE**	1	RO	U	0: Rise not complete 1: Rise completed	—
Error code [H-PCP-J]	**ER**	1	RO	U	0: Operations normal 1: Backup data check error 2: RAM read/write error 3: System structure error 4: Internal communications error 5: A/D converter error 6: Adjustment data error	—

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Name	Iden-tifier	Digits	Attri-bute	Struc-ture	Data range	Factory set value
PID/AT transfer * [H-TIO-□, H-CIO-A, H-SIO-A]	**G1**	1	R/W	C	0: PID control operation 1: AT (Autotuning) operation	0

* Autotuning (AT) is the function which automatically measures, calculates and sets the optimum PID constants according to the set temperature.

Caution for using the Autotuning (AT)
When a temperature change (UP and/or Down) is 1C or less per minute during Autotuning, Autotuning may be cancelled before calculating PID values. In that case, adjust the PID values manually. It is possible to happen when the set value is around the ambient temperature or is close to the maximum temperature achieved by the load.

The following is the conditions necessary to carry out autotuning and the conditions which will cause the autotuning to stop.

Conditions necessary for autotuning:

The autotuning should be executed after satisfying all of the following conditions:

- Operation mode conditions:
  - Auto/Manual transfer (Identifier J1) → Auto mode
  - PID/AT transfer (Identifier G1) → PID control mode
  - Control RUN/STOP transfer (Identifier SR) → Control RUN mode
- The measured value (PV) is without input error range [Input error determination point (high) > Measured value (PV) > Input error determination point (low)].
- The output limiter high limit should be more than 0.1 % and the output limiter low limit should be less than 99.9 %.
- When operation mode is set to "Normal (Can be controlled)."

When the autotuning is finished, the display of each channel automatically returns to "0: PID control operation."

Conditions which will cause the autotuning to stop:

- When the temperature set value (SV) is changed.
- When the memory area is changed.
- When the PV bias value is changed.
- When the AT bias value is changed.
- When transfer to Manual mode using the Auto/Manual transfer.
- When the measured value (PV) goes to input error range [Measured value (PV) ≥ Input error determination point (high) or Input error determination point (low) ≥ Measured value (PV)].
- When the power is cut off.
- When FAIL occurs in the module whose channel is under the autotuning. Otherwise, when FAIL occurs in the H-PCP-J module.
- When transfer to the PID control mode by the PID/AT transfer.
- When operation mode is set to "Unused," "Monitor" or "Alarm."
- When the Control RUN/STOP function is changed to the "Control STOP" function.

When the above-mentioned conditions to stop the autotuning occurs, the autotuning is immediately stopped and switch over to the PID control mode. The PID constants return to the values at the start of the autotuning.

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Name	Iden-tifier	Digits	Attri-bute	Struc-ture	Data range	Factory set value
Temperature set value (SV) ◆ [H-TIO-☐, H-CIO-A]	**S1**	6	R/W	C	TC/RTD input: Within input range (Within setting limiter) Current/voltage input: Within display scale range (Within setting limiter)	0 [a]
Motor speed set value ◆ [H-SIO-A]					Within display scale range (Within setting limiter)	0 [a]
Heat-side proportional band ◆ [H-TIO-☐, H-CIO-A, H-SIO-A]	**P1**	6	R/W	C	0.1 to 1000.0 % of span	H-TIO-☐, H-CIO-A: 3.0 H-SIO-A: 300.0
Cool-side proportional band ◆ [H-TIO-☐, H-CIO-A]	**P2**	6	R/W	C	0.1 to 1000.0 % of span	3.0
Integral time ◆ [H-TIO-☐, H-CIO-A, H-SIO-A]	**I1**	6	R/W	C	1 to 3600 seconds	H-TIO-☐, H-CIO-A: 240 H-SIO-A: 2
Derivative time ◆ [H-TIO-☐, H-CIO-A, H-SIO-A]	**D1**	6	R/W	C	0 to 3600 seconds (0: PI action)	H-TIO-☐, H-CIO-A: 60 H-SIO-A: 0
Overlap/deadband ◆ [H-TIO-☐, H-CIO-A]	**V1**	6	R/W	C	−10.0 to +10.0 % of span	0.0
Control response parameters ◆ [H-TIO-☐, H-CIO-A, H-SIO-A]	**CA**	1	R/W	C	0: Slow 1: Medium 2: Fast In order to perform PID control by using the fuzzy function, specify “Fast.” The fuzzy function is effective to restrict overshoot or undershoot occurring at operation start, or resulting from set value changes. (Fuzzy function correspond to H-TIO-P/R module only.)	0 [b]

[a] The position of the decimal point differs depending on the input range.

[b] Heat control (H-TIO-☐/H-CIO-A): 0 Heat/cool control (H-TIO-☐/H-CIO-A): 2
Position proportioning control (H-TIO-K): 0 Speed control (H-SIO-A): 0

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Name	Iden-tifier	Digits	Attri-bute	Struc-ture	Data range	Factory set value
Alarm 1 set value ◆ [H-TIO-□, H-CIO-A, H-SIO-A]	**A1**	6	R/W	C	TC/RTD input: Within input range or span range Current/voltage input, H-SIO-A: Within display scale range or span range	See Factory set value table of Alarm 1/ Alarm 2 set value *
Alarm 2 set value ◆ [H-TIO-□, H-CIO-A, H-SIO-A]	**A2**	6	R/W	C		
Setting change rate limiter ◆ [H-TIO-□, H-CIO-A, H-SIO-A]	**HH**	6	R/W	C	0.0 to 100.0 % of span/minute	0.0
Heater break alarm set value 1 [H-TIO-A/C/D]	**A3**	6	R/W	C	0.0 to 100.0 A or 0.0 to 30.0 A For the current transformer (CT) input of the H-TIO-A/C/D module.	0.0
Heater break alarm set value 2 [H-CT-A]	**A4**	6	R/W	C	0.0 to 100.0 A or 0.0 to 30.0 A For the current transformer (CT) input of the H-CT-A module.	0.0

* Factory set value table of Alarm 1/Alarm 2 set value

Input type	Alarm type	Alarm 1 set value	Alarm 2 set value
TC/RTD input	Process high alarm	Input range (high limit)	Input range (high limit)
	Process low alarm	Input range (low limit)	Input range (low limit)
	Deviation high alarm, Deviation high/low alarm, Band alarm	50 °C	50 °C
	Deviation low alarm	–50 °C	–50 °C
	No alarm function	Input range (high limit)	Input range (low limit)
Current/voltage input	Process high alarm	100.0 %	100.0 %
	Process low alarm	0.0 %	0.0 %
	Deviation high alarm, Deviation high/low alarm, Band alarm	50 %	50 %
	Deviation low alarm	–50 %	–50 %
	No alarm function	100.0 %	0.0 %

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Name	Identifier	Digits	Attribute	Structure	Data range	Factory set value
Operation mode transfer [H-TIO-□, H-CIO-A, H-SIO-A]	**EI**	1	R/W	C	0: Unused If set to "Unused," no control, monitor or alarm monitor is performed. 1: Monitor If set to "Monitor," only the monitor is performed. No control or alarm monitor is performed. 2: Alarm If set to "Alarm," monitor or alarm monitor is performed. No control is performed. 3: Normal Selected to normal mode to perform control, monitor or alarm monitor.	3
Heat-side proportioning cycle time [H-TIO-□, H-CIO-A]	**T0**	6	R/W	C	1 to 100 seconds Setting will be invalid in current/voltage output.	20 [a]
Cool-side proportioning cycle time [H-TIO-□, H-CIO-A]	**T1**	6	R/W	C	1 to 100 seconds Setting will be invalid in current/voltage output and heat control.	20 [a]
PV bias [H-TIO-□, H-CIO-A, H-SIO-A]	**PB**	6	R/W	C	−5.00 to +5.00 % of span ZK-1103 specification: −Input span to +Input span [b]	0.00 ZK-1103: 0 [c]
Control RUN/STOP transfer [H-PCP-J]	**SR**	1	R/W	U	0: Control STOP 1: Control RUN Only when the initial set mode is "0: Normal communication," control can be start.	0

[a] Relay contact output: 20 seconds
Voltage pulse output, Open collector output, Triac output: 2 seconds

[b] For −Input span < −999.9 ..... Low limit value: −999.9
For −Input span < −99.99 ..... Low limit value: −99.99
For −Input span < −9.999 ..... Low limit value: −9.999

[c] Unit (°C, °F, etc.) and decimal point position (No decimal place, One decimal place, Two decimal places or Three decimal places) depends on input range type.

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Name	Iden-tifier	Digits	Attri-bute	Struc-ture	Data range	Factory set value
Initial setting mode [H-PCP-J]	**IN**	1	R/W	U	0: Normal communication Normal communication is possible. 1: Extended communication [a] Normal and initial setting communication are possible.	0
Memory area number [H-TIO-□, H-CIO-A, H-SIO-A]	**ZA**	1	R/W	U	1 to 8	1
Alarm interlock release [H-TIO-□, H-CIO-A, H-TI-□, H-AI-□]	**AR**	1	WO	U	1: Release (1 only)	–
Auto/Manual transfer [H-TIO-□, H-CIO-A]	**J1**	1	R/W	U	0: Auto 1: Manual Setting will be invalid in ON/OFF control and heat/cool control.	0
Manual output value [H-TIO-□, H-CIO-A]	**ON**	6	R/W	C	−5.0 to +105.0 % Setting will be invalid in ON/OFF control and heat/cool control. H-TIO-C/D [Z-1017 spec.]: −105.0 to 0.0 % (cool-side) 0.0 to +105.0 % (heat-side)	0.0
Temperature rise completion range [H-TIO-□, H-CIO-A]	**HD**	6	R/W	C	1 to 10 °C or 1 to 20 °F	10 or 20 [b]

[a] If extended communication is selected, the content of each identifier described in the **6.3 Initial Settings (Extended Communications) (P. 81)** can be changed or selected.

When the control is started, it is impossible to change the settings to the extended communications. For the change to the extended communications, the control must be first stopped by the "Control RUN/STOP transfer (Identifier SR)."

[b] TC/RTD input: 10 °C or 20 °F
Current/voltage input, H-SIO-A: 10 % of display scale

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Name	Iden-tifier	Digits	Attri-bute	Struc-ture	Data range	Factory set value
Temperature rise completion trigger [1] [H-TIO-□, H-CIO-A]	**HS**	1	R/W	C	0: Unused 1: Used Do not set "1: Used" in H-TIO-H/J module and H-SIO-A module, because temperature rise completion is not judged.	0
Temperature rise completion soak time [H-TIO-□, H-CIO-A]	**T3**	6	R/W	U	0 to 360 minutes	0
AI measured value [H-AI-A/B]	**M5**	6	RO	C	Within display scale range [2]	—
AI alarm 1 status [H-AI-A/B]	**AD**	1	RO	C	0: OFF 1: ON	—
AI alarm 2 status [H-AI-A/B]	**AE**	1	RO	C	0: OFF 1: ON	—
AI alarm 1 set value [H-AI-A/B]	**A5**	6	R/W	C	Within display scale range [2]	Process high alarm: 100.0 Process low alarm: 0.0 No alarm function: 100.0
AI alarm 2 set value [H-AI-A/B]	**A6**	6	R/W	C	Within display scale range [2]	Process high alarm: 100.0 Process low alarm: 0.0 No alarm function: 0.0
AI zero point correction [H-AI-A/B]	**JI**	1	R/W	C	0: Cancel 1: Execution	0
AI full scale correction [H-AI-A/B]	**JJ**	1	R/W	C	0: Cancel 1: Execution	0
AI operation mode transfer [H-AI-A/B]	**NJ**	1	R/W	C	0: Unused mode Neither monitor nor alarm monitor is done in this mode. 1: Normal mode Normal mode in which monitor and alarm are done.	1

[1] If the channel of each of the H-TIO-H/J and H-SIO-A modules is set "1: Used," it does no reach the completion of temperature rise. As a result, the state of this completion (Identifier HE) which is judged by performing the *OR* operation of all the channels cannot be attained, thereby continuing the incompletion of temperature rise.

[2] The position of the decimal point differs depending on AI decimal point position (Identifier JU) setting.

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Name	Iden-tifier	Digits	Attri-bute	Struc-ture	Data range	Factory set value
Control loop break alarm (LBA) status [H-TIO-□, H-CIO-A]	**AP**	1	RO	C	0: OFF 1: ON	—
LBA use selection [H-TIO-□, H-CIO-A]	**HP**	1	R/W	C	0: Unused 1: Used	0
LBA time [H-TIO-□, H-CIO-A]	**C6**	6	R/W	C	1 to 7200 seconds	480
LBA deadband [H-TIO-□, H-CIO-A]	**V2**	6	R/W	C	Input span	0 [a]
AO output value monitor [H-AO-A/B]	**M6**	6	RO	C	Display scale range [b] Data will be valid in manual mode.	—
AO output set value [H-AO-A/B]	**S6**	6	R/W	C	Display scale range [b] Setting will be valid in manual mode.	0.0
AO function selection [H-AO-A/B]	**XO**	6	R/W	C	0: Unused 1: Manual mode (outputs data given by the AO output set value) 2: Temperature measured value (PV) 3: Set value monitor 4: Temperature deviation value (deviation between the temperature measured value and set value monitor) 5: Heat-side manipulated output value 6: Cool-side manipulated output value 7: AI measured value 8: TI measured value 9: Opening monitor (2 to 9: Recorder output mode)	1

[a] The position of the decimal point differs depending on the input range.

[b] The position of the decimal point differs depending on AO decimal point position (Identifier JR) setting.

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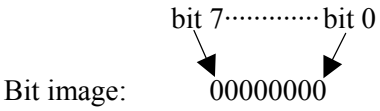
Name	Iden-tifier	Digits	Attri-bute	Struc-ture	Data range	Factory set value
AO corresponding channel setting [H-AO-A/B]	**OY**	6	R/W	C	1 to 20 (TIO channel) 1 to 40 (AI and TI channel) Setting will be valid in recorder output mode.	1
AO zooming high limit [H-AO-A/B]	**CV**	6	R/W	C	AO zooming low limit to 100.0 % Setting will be valid in recorder output mode.	100.0
AO zooming low limit [H-AO-A/B]	**CW**	6	R/W	C	0.0 % to AO zooming high limit Setting will be valid in recorder output mode.	0.0
AO zero point correction [H-AO-A/B]	**JK**	6	R/W	C	−5.00 to +5.00 %	0.00
AO full scale correction [H-AO-A/B]	**JL**	6	R/W	C	−5.00 to +5.00 %	0.00
H-DI-A module input status [H-DI-A]	**L1**	6	RO	M	0 to 255 [a] Contact input status is expressed as a bit image in decimal number.	—

[a] Each contact input status is assigned as a bit image in binary numbers. However, send data from the SR Mini HG SYSTEM be changed to decimal ASCII code from the bit image in binary numbers.



Bit data 0: OFF 1: ON

bit 0: CH1 (DI1)
bit 1: CH2 (DI2)
bit 2: CH3 (DI3)
bit 3: CH4 (DI4)
bit 4: CH5 (DI5)
bit 5: CH6 (DI6)
bit 6: CH7 (DI7)
bit 7: CH8 (DI8)

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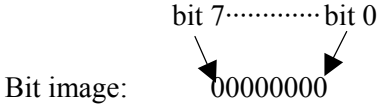
Name	Iden-tifier	Digits	Attri-bute	Struc-ture	Data range	Factory set value
Event DO status [H-DO-C]	**Q3**	6	RO	M	0 to 255 [a] Contact output status is expressed as a bit image in decimal number.	—
Event DO manual output value [H-DO-C]	**Q4**	6	R/W	M	0 to 255 [a] Contact output status is expressed as a bit image in decimal number.	0
Event DO extension alarm set value [H-DO-C]	**A7**	6	R/W	C	TC/RTD input: Within input range or span range Current/voltage input, H-SIO-A: Within display scale range or span range	0 [b]
Cascade monitor [H-CIO-A]	**KH**	6	RO	C	± Input span Data will be valid in slave channel	—
Cascade ON/OFF [H-CIO-A]	**KF**	1	R/W	C	0: OFF 1: ON Setting will be valid in master channel.	0
Cascade gain [H-CIO-A]	**KG**	6	R/W	C	–9.999 to +10.000 As the cascade gain is valid only in the slave channel, the polling or selecting of the same value is made also in the master channel.	1.000
Cascade bias [H-CIO-A]	**KI**	6	R/W	C	–99.99 to +100.00 % As the cascade bias is valid only in the slave channel, the polling or selecting of the same value is made also in the master channel.	–50.00

[a] Each contact output status is assigned as a bit image in binary numbers. However, send data from the SR Mini HG SYSTEM be changed to decimal ASCII code from the bit image in binary numbers.



Bit data 0: OFF 1: ON

bit 0: CH1 (DO1)
bit 1: CH2 (DO2)
bit 2: CH3 (DO3)
bit 3: CH4 (DO4)
bit 4: CH5 (DO5)
bit 5: CH6 (DO6)
bit 6: CH7 (DO7)
bit 7: CH8 (DO8)

[b] The position of the decimal point differs depending on the input range.

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Name	Iden-tifier	Digits	Attri-bute	Struc-ture	Data range	Factory set value
TI measured value [H-TI-A/B/C]	**M7**	6	RO	C	Within input range	—
TI alarm 1 status [H-TI-A/B/C]	**AF**	1	RO	C	0: OFF 1: ON	—
TI alarm 2 status [H-TI-A/B/C]	**AG**	1	RO	C	0: OFF 1: ON	—
TI burnout status [H-TI-A/B/C]	**B2**	1	RO	C	0: OFF 1: ON	—
TI alarm 1 set value [H-TI-A/B/C]	**A8**	6	R/W	C	Within input range	The factory set value varies depending on the alarm type. *
TI alarm 2 set value [H-TI-A/B/C]	**A9**	6	R/W	C	Within input range	The factory set value varies depending on the alarm type. *
TI PV bias [H-TI-A/B/C]	**PC**	6	R/W	C	–5.00 to +5.00 % of span	0.00
TI operation mode transfer [H-TI-A/B/C]	**EJ**	1	R/W	C	0: Unused mode Neither monitor nor alarm monitor is done in this mode. 1: Normal mode Normal mode in which monitor and alarm are done.	1

* Process high alarm: Input range (high)
  Process low alarm: Input range (low)
  No alarm function: Input range (high) for TI alarm 1 set value or
  Input range (low) for TI alarm 2 set value
  The position of the decimal point differs depending on the input range.

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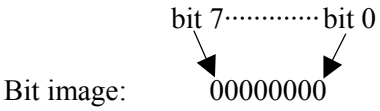
Name	Iden-tifier	Digits	Attri-bute	Struc-ture	Data range	Factory set value
Event DI contact input monitor [H-DI-B]	**L4**	6	RO	M	0 to 255 [a] Contact input status is expressed as a bit image in decimal number.	—
Event DI logic input monitor [H-DI-B]	**L5**	6	RO	L	0 to 15 [b] Logic input status is expressed as a bit image in decimal number.	—
Event DI logic output monitor [H-DI-B]	**Q5**	6	RO	M	0 to 255 [c] Logic output status is expressed as a bit image in decimal number.	—

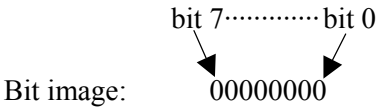
[a] Each contact input status is assigned as a bit image in binary numbers. However, send data from the SR Mini HG SYSTEM be changed to decimal ASCII code from the bit image in binary numbers.



Bit data 0: OFF 1: ON

bit 0: CH1 (DI1) bit 4: CH5 (DI5)
bit 1: CH2 (DI2) bit 5: CH6 (DI6)
bit 2: CH3 (DI3) bit 6: CH7 (DI7)
bit 3: CH4 (DI4) bit 7: CH8 (DI8)

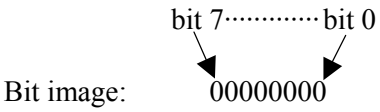
[b] Each logic input status is assigned as a bit image in binary numbers. However, send data from the SR Mini HG SYSTEM be changed to decimal ASCII code from the bit image in binary numbers.



Bit data 0: OFF 1: ON

bit 0: Logic input 1
bit 1: Logic input 2
bit 2: Logic input 3
bit 3: Logic input 4
Bit 4 to bit 7 are unused.

[c] Each logic output status is assigned as a bit image in binary numbers. However, send data from the SR Mini HG SYSTEM be changed to decimal ASCII code from the bit image in binary numbers.



Bit data 0: OFF 1: ON

bit 0: Logic output 1 bit 4: Logic output 5
bit 1: Logic output 2 bit 5: Logic output 6
bit 2: Logic output 3 bit 6: Logic output 7
bit 3: Logic output 4 bit 7: Logic output 8

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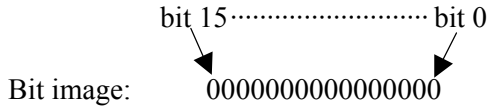
Name	Iden-tifier	Digits	Attri-bute	Struc-ture	Data range	Factory set value
H-CT-A module heater break alarm status [H-CT-A]	**AH**	1	RO	C	0: Normal 1: Break 2: Welding	—
Comprehensive alarm status [H-PCP-J]	**AJ**	6	RO	U	0 to 2047 * Alarm status is expressed as a bit image in decimal number.	—
Positioning monitor [H-TIO-K]	**M8**	6	RO	C	−5.0 to +105.0 %	—
Positioning output neutral zone [H-TIO-K]	**V3**	6	R/W	C	0.1 to 10.0 % of motor time	2.0
Motor time [H-TIO-K]	**TJ**	6	R/W	C	5 to 1000 seconds	10
Integrated output limiter [H-TIO-K]	**OS**	6	R/W	C	100.0 to 200.0 % of motor time	150.0
Manual positioning output value [H-TIO-K]	**OO**	6	R/W	C	−5.0 to +105.0 %	0.0

* Each alarm status is assigned as a bit image in binary numbers. However, send data from the SR Mini HG SYSTEM be changed to decimal ASCII code from the bit image in binary numbers.



Bit data 0: OFF 1: ON

bit 0: Logical *OR* of alarm 1 status in all channels
bit 1: Logical *OR* of alarm 2 status in all channels
bit 2: Logical *OR* of burnout alarm status in all channels
bit 3: Logical *OR* of heater break alarm status in all channels
bit 4: Temperature rise completion status
bit 5: Logical *OR* of AI alarm 1 status in all channels
bit 6: Logical *OR* of AI alarm 2 status in all channels
bit 7: Logical *OR* of control loop break alarm status in all channels
bit 8: Logical *OR* of TI alarm 1 status in all channels
bit 9: Logical *OR* of TI alarm 2 status in all channels
bit 10: Logical *OR* of TI burnout alarm status in all channels
Bit 11 to bit 15 are unused.

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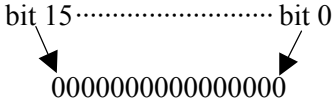
Name	Iden-tifier	Digits	Attri-bute	Struc-ture	Data range	Factory set value
H-DO-G manipulated output value [H-DO-G]	**D0**	6	RO	C	–5.0 to +105.0 %	—
H-DO-G DO output status [H-DO-G]	**D2**	6	RO	C	0 to 65535 * Output status is expressed as a bit image in decimal number.	—
H-DO-G output limiter (high) [H-DO-G]	**D3**	6	R/W	C	Output limiter (low) to 105.0 %	100.0
H-DO-G output limiter (low) [H-DO-G]	**D4**	6	R/W	C	–5.0 % to Output limiter (high)	0.0
H-DO-G output cycle time [H-DO-G]	**D5**	6	R/W	C	1 to 100 seconds	2
H-DO-G Auto/Manual transfer [H-DO-G]	**D6**	6	R/W	C	0: Auto 1: Manual Setting will be invalid in ON/OFF control and heat/cool control.	0
H-DO-G manual output value [H-DO-G]	**D7**	6	R/W	C	–5.0 to +105.0 % Setting will be invalid in ON/OFF control and heat/cool control.	0.0
H-DO-G master channel setting [H-DO-G]	**D8**	6	R/W	C	0 to The number of H-TIO-□ module use channel (0: Unused)	0
H-DO-G output ratio set value [H-DO-G]	**D9**	6	R/W	C	0.001 to 9.999	1.00

* Each output status is assigned as a bit image in binary numbers. However, send data from the SR Mini HG SYSTEM be changed to decimal ASCII code from the bit image in binary numbers.



Bit data 0: OFF 1: ON

bit 0: CH1 (DO1)
bit 1: CH2 (DO2)
bit 2: CH3 (DO3)
bit 3: CH4 (DO4)
bit 4: CH5 (DO5)
bit 5: CH6 (DO6)
bit 6: CH7 (DO7)
bit 7: CH8 (DO8)
bit 8: CH9 (DO9)
bit 9: CH10 (DO10)
bit 10: CH11 (DO11)
bit 11: CH12 (DO12)
bit 12: CH13 (DO13)
bit 13: CH14 (DO14)
bit 14: CH15 (DO15)
bit 15: CH16 (DO16)

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Name	Iden-tifier	Digits	Attri-bute	Struc-ture	Data range	Factory set value
PLC scanning time setting * [H-PCP-J]	**ST**	6	R/W	U	0 to 3000 ms	10
Integral time limiter at AT end [H-TIO-□, H-CIO-A, H-SIO-A]	**GY**	6	R/W	U	1 to 3600 seconds Setting will be valid in heat/cool control.	3600

* Set the PLC scanning time (time of waiting for a response from the PLC) so as to adapt to the environment used.

Setting example: Set PLC scanning time to any value more than twice as long as the maximum scanning time of PLC.

If PLC scanning time is extremely short (When at a factory set value of 10 ms as an example), the SR Mini HG SYSTEM may detect the time-out not conducting normal communication processing.
The maximum scanning time of PLC differs depending on the CPU processing speed, I/O unit configuration and the user program capacity of the PLC.

6.3 Initial Setting (Extended Communication)

This section describes the initialize setting changing procedure when this system is changed to initialize setting mode. Change the setting correctly in accordance with precautions in each item.

⚠ WARNING

The Initial setting data should be set according to the application before setting any parameter related to operation. Once the Initial setting data is set correctly, those data is not necessary to be changed for the same application under normal conditions. If they are changed unnecessarily, it may result in malfunction or failure of the instrument. RKC will not bear any responsibility for malfunction or failure as a result of improper changes in the Initial setting.

📖 **The control unit cannot be switched to the extended communication state at control start (during control). If it needs to be switched to the above state, first stop the control by "Control RUN/STOP transfer."**

📖 **No control can be started during extended communication. If the control needs to be re-started, first switch the control unit the normal communication state.**

☞ For Control RUN/STOP transfer (Identifier SR) and Initial setting mode (Identifier IN), see **6.2 Communication Identifier List (P. 65)**.

■ Communication Identifier List

📖 Note that there are identifiers which indicate that communication is not possible depending on the specification.

📖 • Attributes

R/W: Read and Write SR Mini HG SYSTEM ↔ Host computer
WO: Write only SR Mini HG SYSTEM ← Host computer

• Structure

C: Data for each channel L: Data for each event input logic circuit
M: Data for each module U: Data for each unit address

☞ For the data structure, see the **6.1.3 Communication data structure (P. 60)**.

📖 Data of identifier H3 with H-TIO-□/H-CIO-A module is different from H-SIO-A module. Data is discriminated by channel number (module number).

Identifier H3: For H-CIO-A module..... Cascade DI function selection
For H-SIO-A module ..... DI process selection

☞ For the channel number, see the **8.2.9 Assignment of channels (P. 183)**.

Name	Iden-tifier	Digits	Attri-bute	Struc-ture	Data range	Factory set value
Input range number [H-TIO-□, H-CIO-A, H-SIO-A]	**XI**	6	R/W	C	H-TIO-A/B/C/D/K/P: 0 to 63 H-TIO-E/F/G/R, H-CIO-A: 0 to 120 H-TIO-H/J, H-CIO-A: 0 to 12 H-SIO-A: 0 (Fixed) If the input range number is changed, all of the settings corresponding to the channels in the relevant module return to the default values. See **Input range table (P. 107)**	The factory set value varies depending on the specifications when ordering.
Setting limiter (high) [H-TIO-□, H-CIO-A, H-SIO-A]	**SH**	6	R/W	C	TC/RTD input: Setting limiter (low) to Input range (high)	Input range (high)
					Current/voltage input, H-SIO-A: Setting limiter (low) to Display scale high	Display scale high
Setting limiter (low) [H-TIO-□, H-CIO-A, H-SIO-A]	**SL**	6	R/W	C	TC/RTD input: Input range (low) to Setting limiter (high)	Input range (low)
					Current/voltage input, H-SIO-A: Display scale low to Setting limiter (high)	Display scale low
Digital filter [H-TIO-□, H-CIO-A, H-SIO-A]	**F1**	6	R/W	C	H-TIO-A/B/C/D/K/P 0 to 100 seconds (0: OFF) H-TIO-E/F/G/H/J/R, H-CIO-A, H-SIO-A 0.0 to 100.0 seconds (0.0: OFF)	0 or 0.0
Input error determination point (high) [H-TIO-□, H-CIO-A, H-SIO-A]	**AV**	6	R/W	C	TC/RTD input: Within input range	Input range (high)
					Current/voltage input, H-SIO-A: Within display scale range	Display scale high

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Name	Identifier	Digits	Attribute	Structure	Data range	Factory set value
Input error determination point (low) [H-TIO-☐, H-CIO-A, H-SIO-A]	**AW**	6	R/W	C	TC/RTD input: Within input range	Input range (low)
					Current/voltage input, H-SIO-A: Within display scale range	Display scale low
Action at input error (high) [H-TIO-☐, H-CIO-A, H-SIO-A]	**WH**	1	R/W	C	0: Normal control 1: Manipulated output value at input error	0 [a]
Action at input error (low) [H-TIO-☐, H-CIO-A, H-SIO-A]	**WL**	1	R/W	C	0: Normal control 1: Manipulated output value at input error	0
AT bias [H-TIO-☐, H-CIO-A, H-SIO-A]	**GB**	6	R/W	C	Within ± input span range	0 [b]
Output limiter (high) [For heat/cool control: Heat-side output limiter (high)] [H-TIO-☐, H-CIO-A, H-SIO-A]	**OH**	6	R/W	C	[Heat control, Position proportioning control and Speed control] Output limiter (low) to 105.0 % [Heat/cool control] Heat-side output limiter (high): −5.0 % to +105.0 % Heat-side output limiter (low): −5.0 % (fixed)	100.0 [c]
Output limiter (low) [For heat/cool control: Cool-side output limiter (high)] [H-TIO-☐, H-CIO-A, H-SIO-A]	**OL**	6	R/W	C	[Heat control, Position proportioning control and Speed control] −5.0 % to Output limiter (high) [Heat/cool control] Cool-side output limiter (high): −5.0 % to +105.0 % Cool-side output limiter (low): −5.0 % (fixed)	0.0 [d]

[a] Heat control (H-TIO-☐/H-CIO-A): 0 — Heat/cool control (H-TIO-☐/H-CIO-A): 1
Position proportioning control (H-TIO-K): 0 — Speed control (H-SIO-A): 0

[b] The position of the decimal point differs depending on the input range.

[c] Heat control (H-TIO-☐/H-CIO-A): 100.0 — Heat/cool control (H-TIO-☐/H-CIO-A): 100.0
Position proportioning control (H-TIO-K): 100.0 — Speed control (H-SIO-A): 100

[d] Heat control (H-TIO-☐/H-CIO-A): 0.0 — Heat/cool control (H-TIO-☐/H-CIO-A): 100.0
Position proportioning control (H-TIO-K): 0.0 — Speed control (H-SIO-A): 0

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Name	Identifier	Digits	Attribute	Structure	Data range	Factory set value
ON/OFF control differential gap (upper) [H-TIO-☐, H-CIO-A, H-SIO-A]	**IV**	6	R/W	C	0.00 to 10.00 % of span	0.02
ON/OFF control differential gap (lower) [H-TIO-☐, H-CIO-A, H-SIO-A]	**IW**	6	R/W	C	0.00 to 10.00 % of span	0.02
Manipulated output value at input error [H-TIO-☐, H-CIO-A, H-SIO-A]	**OE**	6	R/W	C	−5.0 to +105.0 % (Heat control, Position proportioning control and Speed control) −105.0 to +105.0 % (Heat/cool control)	0.0
Output change rate limiter (up) [H-TIO-☐, H-CIO-A, H-SIO-A]	**PH**	6	R/W	C	0.0 to 100.0 %/second (0.0: OFF) Setting will be invalid in ON/OFF control.	0.0
Output change rate limiter (down) [H-TIO-☐, H-CIO-A, H-SIO-A]	**PL**	6	R/W	C	0.0 to 100.0 %/second (0.0: OFF) Setting will be invalid in ON/OFF control.	0.0
Direct/Reverse action selection [H-TIO-☐, H-CIO-A, H-SIO-A]	**XE**	1	R/W	C	0: Direct action 1: Reverse action If the Direct/Reverse action selection is changed, all of the settings corresponding to the channels in the relevant module return to the default values. Setting will be invalid in heat/cool control.	The factory set value varies depending on the specifications when ordering.

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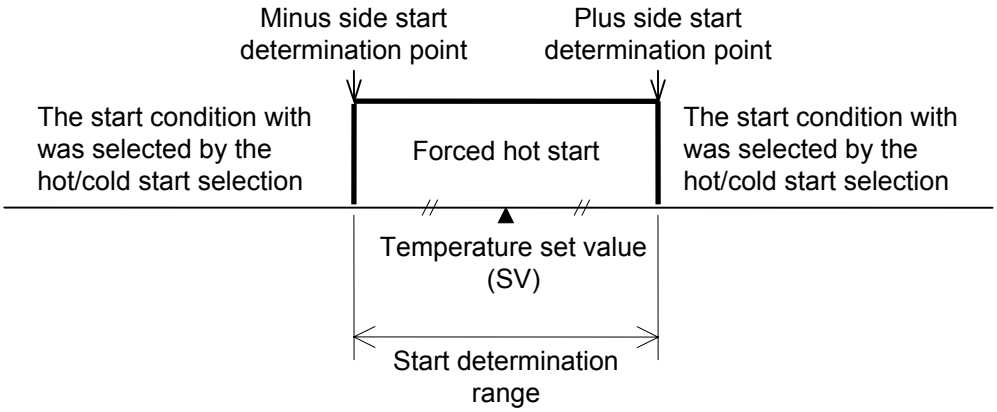
Name	Identifier	Digits	Attribute	Structure	Data range	Factory set value
Hot/Cold start selection [H-TIO-□, H-CIO-A, H-SIO-A]	**XN**	1	R/W	C	0: Hot start At restarting Operation mode → Same as mode before the power failure Output value → Same as value before the power failure 1: Cold start At restarting Operation mode → Same as mode before the power failure Output value → Output limiter (low)	1
Start determination point * [H-TIO-□, H-CIO-A]	**SX**	6	R/W	C	0.0 to 100.0 % of span (Deviation setting from the temperature set value) Setting will be invalid in H-SIO-A module.	3.0

* On restarting after power failure, if the temperature measured value (PV) is within the setting range by the start determination points, the hot start will definitely be carried out. If the temperature measured value (PV) is outside this range, the operation will begin with the start condition with was selected by the hot/cold start selection (Identifier XN).


Minus side start determination point
Plus side start determination point
The start condition with was selected by the hot/cold start selection
Forced hot start
The start condition with was selected by the hot/cold start selection
Temperature set value (SV)
Start determination range

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Name	Iden-tifier	Digits	Attri-bute	Struc-ture	Data range	Factory set value
Control RUN/STOP holding * [H-PCP-J]	**X1**	1	R/W	U	0: Not hold Start-up from control stop status 1: Hold Start-up from before the stop status 2: Start-up from control run status	1
Temperature rise completion hold function [H-PCP-J]	**EK**	1	R/W	U	0: Not hold 1: Hold	1
Interval time setting COM.PORT1/ COM.PORT2 [H-PCP-J]	**ZX**	6	R/W	U	0 to 100 ms	1
Interval time setting COM.PORT3 [H-PCP-J]	**ZY**	6	R/W	U	0 to 100 ms	1

* Action after power-ON differs depending on control RUN/STOP holding (Identifier X1) setting.

Control RUN/STOP holding (Identifier X1)	Status after power-ON	
	Operation mode transfer (Identifier EI)	Control RUN/STOP transfer (Identifier SR)
0: Not hold	Same as mode before the power failure	"0: Control STOP" Stopped until "1: Control RUN" is instructed from the PLC or host computer.
1: Hold	Same as mode before the power failure	Same as status before the power failure Control before power failure is maintained even if no PLC or host computer is connected.
2: Start-up from control run status	"1: Monitor" mode However if the operation mode is set to "0: Unused," "0: Unused" remains unchanged.	"1: Control RUN" However, no control is performed until the operation mode is set to "3: Normal (perform control)."

☞ For the Operation mode transfer (Identifier EI) and Control RUN/STOP transfer (Identifier SR), see the **6.2 Communication Identifier List (P. 65)**.

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Name	Iden-tifier	Digits	Attri-bute	Struc-ture	Data range	Factory set value
Alarm 1 differential gap [H-TIO-□, H-CIO-A, H-SIO-A]	**HA**	6	R/W	U	0.00 to 10.00 % of span	0.10
Alarm 2 differential gap [H-TIO-□, H-CIO-A, H-SIO-A]	**HB**	6	R/W	U	0.00 to 10.00 % of span	0.10
Alarm 1 type selection [H-TIO-□, H-CIO-A, H-SIO-A]	**XA**	1	R/W	U	0: Process high alarm 1: Process low alarm 2: Deviation high alarm 3: Deviation low alarm 4: Deviation high/low alarm 5: Band alarm 6: No alarm function	The factory set value varies depending on the specifications when ordering.
Alarm 2 type selection [H-TIO-□, H-CIO-A, H-SIO-A]	**XB**	1	R/W	U	0: Process high alarm 1: Process low alarm 2: Deviation high alarm 3: Deviation low alarm 4: Deviation high/low alarm 5: Band alarm 6: No alarm function	The factory set value varies depending on the specifications when ordering.
Alarm 1 hold action [H-TIO-□, H-CIO-A, H-SIO-A]	**WA**	1	R/W	U	0: Not provided 1: Provided 2: Re-hold action Re-hold action will be valid in deviation alarm.	The factory set value varies depending on the specifications when ordering.
Alarm 2 hold action [H-TIO-□, H-CIO-A, H-SIO-A]	**WB**	1	R/W	U	0: Not provided 1: Provided 2: Re-hold action Re-hold action will be valid in deviation alarm.	The factory set value varies depending on the specifications when ordering.
Alarm 1 interlock [H-TIO-□, H-CIO-A, H-SIO-A]	**LA**	1	R/W	U	0: Not provided 1: Provided	0
Alarm 2 interlock [H-TIO-□, H-CIO-A, H-SIO-A]	**LB**	1	R/W	U	0: Not provided 1: Provided	0

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Name	Iden-tifier	Digits	Attri-bute	Struc-ture	Data range	Factory set value
Alarm 1 action at input error [H-TIO-□, H-CIO-A, H-SIO-A]	**OA**	1	R/W	U	0: Normal alarm action 1: Forced alarm ON when temperature measured value exceeds abnormal input trigger input.	0
Alarm 2 action at input error [H-TIO-□, H-CIO-A, H-SIO-A]	**OB**	1	R/W	U	0: Normal alarm action 1: Forced alarm ON when temperature measured value exceeds abnormal input trigger input.	0
Number of alarm delay times [H-TIO-□, H-CIO-A, H-SIO-A]	**DF**	6	R/W	U	0 to 255 times	0
Module initialization * [H-PCP-J]	**CL**	1	R/W	U	0: Normal state (Initialization is not executed) 1: Initialize only the new module (Only modules which are not recognized by the H-PCP-J module are initialized) 2: Initialize all module Only 1 or 2 can be used in the selecting and the value will automatically return to 0 after the selection of 1 or 2.	0

* Initialize method for changing the module composition
To change module configuration, use the following procedures:
- When a module is added to the control unit.....Initialize only the new module
- When a module is deleted from the control unit .....Initialize only the new module
- When a module is inserted (added) between the modules in the control unit .....Initialize all modules
- To change the arrangement of the modules in the control unit .....Initialize all modules

Note that when all modules are initialized all internal data of all modules are set to the default values.

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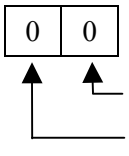
Name	Iden-tifier	Digits	Attri-bute	Struc-ture	Data range	Factory set value
This identifier is unused with this module (H-PCP-J). (H-PCP-A/B module DO type selection)	**VP**	6	R/W	U	0000 to 9999 **Do not set this module (H-PCP-J). Set by identifier VU (H-PCP-J module DO type selection).**	CH1: 9 CH2: 1 CH3: 2 CH4: 3
CT channel setting [H-CT-A]	**ZF**	6	R/W	C	0 to 20 (0: Unused) Allocates the channels for H-TIO-□ module to the input channels of H-CT-A module.	The factory set value varies depending on the specifications when ordering.
DO function selection [H-DO-A/B/D]	**LT**	6	R/W	M	00 to 88 *	The factory set value varies depending on the specifications when ordering.

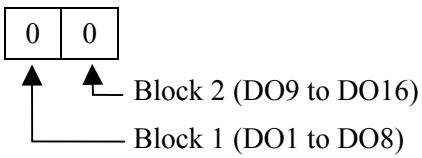
* DO function selection (H-DO-A/B/D module)

H-DO-A/B module



Setting will be valid for only block 1 (DO1 to DO4) in case of H-DO-B module.

H-DO-D module



Data range
- 0: No alarm function
- 1: Alarm 1
- 2: Alarm 2
- 3: Burnout
- 4: Heater break alarm (HBA)
- 5: AI alarm 1
- 6: AI alarm 2
- 7: Control loop break alarm (LBA)
- 8: (Not settable)

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Name	Iden-tifier	Digits	Attri-bute	Struc-ture	Data range	Factory set value
DI function selection [H-DI-A]	**XK**	6	R/W	M	0: Unused 1: Function mode 1 – Memory area transfer (ENABLE terminal is used) After area selection setting, the actual area is changed by detecting the ENABLE edge. – Control RUN/STOP transfer – Alarm interlock release 2: Function mode 2 – Memory area transfer The actual area is changed approximately 2 seconds after area selection setting. – Control RUN/STOP transfer – Alarm interlock release	1
DI using selection [H-DI-A]	**H2**	6	R/W	M	0 to 255 *	255

* DI using selection (H-DI-A module) ×: Used –: Unused

Setting data	Memory area transfer	Control RUN/STOP transfer	Alarm interlock release
63	×	×	×
127			
191			
255			
48	–	×	×
47	×	–	×
32	–	–	×
31	×	×	–
16	–	×	–
15	×	–	–
0	–	–	–

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Name	Iden-tifier	Digits	Attri-bute	Struc-ture	Data range	Factory set value
AI input range number [H-AI-A/B]	**VK**	6	R/W	C	0: 0 to 10 mV DC 1: −10 to +10 mV DC 2: 0 to 100 mV DC 3: −100 to +100 mV DC 4: 0 to 1 V DC 5: −1 to +1 V DC 6: 0 to 5 V DC 7: 1 to 5 V DC 8: −5 to +5 V DC 9: 0 to 10 V DC 10: −10 to +10 V DC 11: 0 to 20 mA DC 12: 4 to 20 mA DC Voltage (low) input group: 0 to 8 Voltage (high) input group: 9 to 10 Current input group: 11 to 12 An input type change may only be made within the input groups. If the input range number is changed, all of the settings corresponding to the channels in the relevant module return to the default values.	The factory set value varies depending on the specifications when ordering.
AI display scale high [H-AI-A/B]	**JS**	6	R/W	C	Span 10000 or less * (Within −9999 to +10000)	100.0
AI display scale low [H-AI-A/B]	**JV**	6	R/W	C	Span 10000 or less * (Within −9999 to +10000)	0.0
AI alarm 1 differential gap [H-AI-A/B]	**HC**	6	R/W	U	0.00 to 10.00 % of span	0.10
AI alarm 2 differential gap [H-AI-A/B]	**HF**	6	R/W	U	0.00 to 10.00 % of span	0.10

* The position of the decimal point differs depending on AI decimal point position (Identifier JU) setting.

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Name	Iden-tifier	Digits	Attri-bute	Struc-ture	Data range	Factory set value
AI alarm 1 type selection [H-AI-A/B]	**XC**	1	R/W	U	0: Process high alarm 1: Process low alarm 2 to 6: No alarm function	The factory set value varies depending on the specifications when ordering.
AI alarm 2 type selection [H-AI-A/B]	**XD**	1	R/W	U		
AI alarm 1 hold action [H-AI-A/B]	**WC**	1	R/W	U	0: Not provided 1: Provided	The factory set value varies depending on the specifications when ordering.
AI alarm 2 hold action [H-AI-A/B]	**WD**	1	R/W	U		
AI alarm 1 interlock [H-AI-A/B]	**LC**	1	R/W	U	0: Not provided 1: Provided	0
AI alarm 2 interlock [H-AI-A/B]	**LD**	1	R/W	U	0: Not provided 1: Provided	0
Number of AI alarm delay times [H-AI-A/B]	**TK**	6	R/W	U	0 to 255 times	0
AI decimal point position [H-AI-A/B]	**JU**	1	R/W	C	0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places	1
Power supply frequency selection [H-PCP-J]	**JT**	1	R/W	U	0: 50 Hz 1: 60 Hz	0
AI digital filter [H-AI-A/B]	**F2**	6	R/W	C	0.0 to 100.0 seconds (0.0: OFF)	0.0
AI moving average [H-AI-A/B]	**VA**	1	R/W	C	0: Not provided 1: Provided	0

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Name	Iden-tifier	Digits	Attri-bute	Struc-ture	Data range	Factory set value
Display scale high [H-TIO-H/J, H-CIO-A, H-SIO-A]	**XV**	6	R/W	C	Span 10000 or less [1] (Within –9999 to +10000)	H-TIO-H/J, H-CIO-A: 100.0 H-SIO-A: 300
Display scale low [H-TIO-H/J, H-CIO-A, H-SIO-A]	**XW**	6	R/W	C	Span 10000 or less [1] (Within –9999 to +10000)	H-TIO-H/J, H-CIO-A: 0.0 H-SIO-A: 0
Decimal point position [H-TIO-H/J, H-CIO-A, H-SIO-A]	**XU**	1	R/W	C	0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places	H-TIO-H/J, H-CIO-A: 1 H-SIO-A: 0
AO display scale high [H-AO-A/B]	**HV**	6	R/W	C	Span 10000 or less [2] (Within –9999 to +10000)	100.0
AO display scale low [H-AO-A/B]	**HW**	6	R/W	C	Span 10000 or less [2] (Within –9999 to +10000)	0.0
AO decimal point position [H-AO-A/B]	**JR**	1	R/W	C	0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places	1
AO output change rate limiter [H-AO-A/B]	**PW**	6	R/W	C	0.0 to 100.0 %/second (0.0: OFF)	0.0

[1] The position of the decimal point differs depending on Decimal point position (Identifier XU) setting.

[2] The position of the decimal point differs depending on AO decimal point position (Identifier JR) setting.

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Name	Iden-tifier	Digits	Attri-bute	Struc-ture	Data range	Factory set value
Event DO function selection [H-DO-C]	**XF**	6	R/W	C	0 to 30 *	0
Event DO corresponding channel setting [H-DO-C]	**XG**	6	R/W	C	1 to 40 *	1
Event DO mode select setting [H-DO-C]	**XH**	6	R/W	C	0 to 40 *	0
Event DO extension alarm differential gap [H-DO-C]	**HG**	6	R/W	U	0.00 to 10.00 %	0.10
Event DO extension alarm interlock [H-DO-C]	**LE**	1	R/W	U	0: Not provided 1: Provided	0
Number of Event DO extension alarm delay times [H-DO-C]	**TI**	6	R/W	U	0 to 255 times	0
Cascade tracking [H-CIO-A]	**XL**	1	R/W	M	0: Not provided Cascade monitored value becomes zero. 1: Provided Cascade monitored value just before is hold.	0
Cascade data selection [H-CIO-A]	**KD**	1	R/W	M	0: Manipulated outpur value 1: Temperature measured value (PV) 2: Temperature set value (SV) 3: Set value monitor 4: Temperature deviation	0

* Set the function, corresponding channel and mode select of Event DO. Event DO uses it with event output function.

☞ For the data, see the ■ **Event output function (P. 101)**.

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Name	Iden-tifier	Digits	Attri-bute	Struc-ture	Data range	Factory set value
Cascade DI function selection [H-CIO-A]	**H3**	1	R/W	M	0: Unused 1: Cascade control ON/OFF only 2: Auto/Manual transfer only 3: DI1 valid (Cascade control ON/OFF), DI2 valid (Auto/Manual transfer)	3
DI process selection * [H-SIO-A]					0: Unused 1: H-SIO-A open/closed loop control transfer only 2: Control RUN/STOP transfer only 3: H-SIO-A open/closed loop control transfer and Control RUN/STOP transfer	3

* DI process selection setting or communication setting ×: Valid –: Invalid

Transfer by external contact input	Transfer via communication	
DI process selection (Identifier H3)	**H-SIO-A open/closed loop control transfer (Identifier SM)**	**Control RUN/STOP transfer (Identifier SR)**
0: Unused	×	×
1: H-SIO-A open/closed loop control transfer only	–	×
2: Control RUN/STOP transfer only	×	–
3: H-SIO-A open/closed loop control transfer and Control RUN/STOP transfer	–	–

☞ For Control RUN/STOP transfer (Identifier SR), see **6.2 Communication Identifier List (P. 65)**.

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Name	Iden-tifier	Digits	Attri-bute	Struc-ture	Data range	Factory set value
TI input range number [H-TI-A/B/C]	**XJ**	6	R/W	C	0 to 120 If the input range number is changed, all of the settings corresponding to the channels in the relevant module return to the default values. See **Input range table (P. 107)**	The factory set value varies depending on the specifications when ordering.
TI digital filter [H-TI-A/B/C]	**F3**	6	R/W	C	0.0 to 100.0 seconds (0.0: OFF)	0.0
TI alarm 1 differential gap [H-TI-A/B/C]	**HI**	6	R/W	U	0.00 to 10.00 % of span	0.10
TI alarm 2 differential gap [H-TI-A/B/C]	**HJ**	6	R/W	U	0.00 to 10.00 % of span	0.10
TI alarm 1 type selection [H-TI-A/B/C]	**XP**	1	R/W	U	0: Process high alarm 1: Process low alarm 2 to 6: No alarm function	The factory set value varies depending on the specifications when ordering.
TI alarm 2 type selection [H-TI-A/B/C]	**XQ**	1	R/W	U		
TI alarm 1 hold action [H-TI-A/B/C]	**WE**	1	R/W	U	0: Not provided 1: Provided	The factory set value varies depending on the specifications when ordering.
TI alarm 2 hold action [H-TI-A/B/C]	**WF**	1	R/W	U		
TI alarm 1 interlock [H-TI-A/B/C]	**LF**	1	R/W	U	0: Not provided 1: Provided	0
TI alarm 2 interlock [H-TI-A/B/C]	**LG**	1	R/W	U	0: Not provided 1: Provided	0
TI alarm 1 action at input error [H-TI-A/B/C]	**OC**	1	R/W	U	0: Normal alarm action 1: Forced alarm ON when temperature measured value exceeds abnormal input trigger input.	0
TI alarm 2 action at input error [H-TI-A/B/C]	**OD**	1	R/W	U		0
Number of TI alarm delay times [H-TI-A/B/C]	**DG**	6	R/W	U	0 to 255 times	0

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Name	Iden-tifier	Digits	Attri-bute	Struc-ture	Data range	Factory set value
Event DI type selection 1 [H-DI-B]	**R1**	6	R/W	L	0 to 30 * (17 to 30: Not settable)	0
Event DI type selection 2 [H-DI-B]	**R2**	6	R/W	L	0 to 30 * (17 to 30: Not settable)	0
Event DI type selection 3 [H-DI-B]	**R3**	6	R/W	L	0 to 30 * (17 to 30: Not settable)	0
Event DI type selection 4 [H-DI-B]	**R4**	6	R/W	L	0 to 30 * (17 to 30: Not settable)	0
Event DI corresponding channel selection 1 [H-DI-B]	**E1**	6	R/W	L	1 to 80 *	1
Event DI corresponding channel selection 2 [H-DI-B]	**E2**	6	R/W	L	1 to 80 *	1
Event DI corresponding channel selection 3 [H-DI-B]	**E3**	6	R/W	L	1 to 80 *	1
Event DI corresponding channel selection 4 [H-DI-B]	**E4**	6	R/W	L	1 to 80 *	1
Event DI reversal selection 1 [H-DI-B]	**W1**	1	R/W	L	0: Normal 1: Reversal	0
Event DI reversal selection 2 [H-DI-B]	**W2**	1	R/W	L	0: Normal 1: Reversal	0
Event DI reversal selection 3 [H-DI-B]	**W3**	1	R/W	L	0: Normal 1: Reversal	0
Event DI reversal selection 4 [H-DI-B]	**W4**	1	R/W	L	0: Normal 1: Reversal	0
Event DI logic circuit selection [H-DI-B]	**LU**	1	R/W	L	0: *AND* (1 active) 1: *NAND* (0 active) 2: *OR* (1 active) 3: *NOR* (0 active)	0
Event DI delay timer setting [H-DI-B]	**LW**	6	R/W	L	0 to 255 times	1

* Set the type and corresponding channel of Event DI. Event DI uses it with logic input function.

☞ For the data , see the ■ **Logic input function (P. 105)**.

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Name	Iden-tifier	Digits	Attri-bute	Struc-ture	Data range	Factory set value
Number of HBA trigger points [H-CT-A]	**DH**	6	R/W	U	0 to 255 times	5
Positioning adjustment counter [H-TIO-K]	**FV**	6	R/W	C	0 to 100 [a]	0
H-PCP-J module DO de-energized selection [H-PCP-J]	**VS**	6	R/W	U	0 to 255 [b] Selection status is expressed as a bit image in decimal number.	0

[a] Positioning adjustment counter
The opening adjustment and the motor time are taken in. When the specified setting counter value is input, the operations begin. (This is only valid when control is stopped.)

Always adjust the opening first and capture the motor time after the adjustment is complete.

Motor time (Identifier TJ) → FBR opening adjustment → Capture the motor time → Setting to normal status

For details, see the ■ **Positioning adjustment counter (P. 107)**.

For the motor time (Identifier TJ), see **6.2 Communication Identifier List (P. 65)**.

[b] Each DO selection status is assigned as a bit image in binary numbers. However, send data from the SR Mini HG SYSTEM be changed to decimal ASCII code from the bit image in binary numbers.

bit 15 ····· bit 0

Bit image: 0000000000000000

Bit data 0: Energized 1: De-energized

bit 0: DO1
bit 1: DO2
bit 2: DO3
bit 3: DO4
bit 4: DO5
bit 5: DO6
bit 6: DO7
bit 7: DO8

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Name	Iden-tifier	Digits	Attri-bute	Struc-ture	Data range	Factory set value
H-SIO-A input frequency at full scale [H-SIO-A]	**JF**	6	R/W	C	10 to 50000 Hz	130
H-SIO-A control range [H-SIO-A]	**SC**	6	R/W	C	0.00 to 50.00 %	10.00
H-SIO-A output scale high [H-SIO-A]	**SU**	6	R/W	C	H-SIO-A output scale low to 10000 *	400
H-SIO-A output scale low [H-SIO-A]	**SD**	6	R/W	C	–9999 to H-SIO-A output scale high *	0
H-SIO-A measuring method [H-SIO-A]	**SP**	1	R/W	C	0: Periodic computation method 1: Pulse count method	0
H-SIO-A divide ratio [H-SIO-A]	**SQ**	6	R/W	C	1 to 1000 Effective only for periodic computation method.	10
H-SIO-A gate time [H-SIO-A]	**RT**	6	R/W	C	0.1 to 4.0 seconds Effective only for pulse count method.	1.0
H-SIO-A auto zero time [H-SIO-A]	**SA**	6	R/W	C	1 to 100 seconds	5
H-SIO-A alarm hold cancel time [H-SIO-A]	**SW**	6	R/W	U	1 to 255 seconds Setting will be invalid in no alarm hold action.	60
H-SIO-A open/closed loop control transfer [H-SIO-A]	**SM**	1	R/W	C	0: Closed loop control (PID control) 1: Open loop control	0
H-SIO-A correction trigger [H-SIO-A]	**SE**	1	R/W	C	0: Normal 1: Correction executed 2: Correction canceled Processing time of correction execution or cancel is about one second. Do not turn OFF the power during the processing time. In addition, maintain the setting more than 0.5 second in order to let it recognize modification in setting modification.	0
H-SIO-A correction actual measured value [H-SIO-A]	**J2**	6	R/W	C	Within display scale range *	0

* The position of the decimal point differs depending on Decimal point position (Identifier XU) setting.

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Name	Iden-tifier	Digits	Attri-bute	Struc-ture	Data range	Factory set value
PV bias unit selection [H-TIO-H/J, H-CIO-A, H-SIO-A]	**JW**	1	R/W	U	0: % (of span) 1: Unit of input range	0 *
H-PCP-J module DO type selection [H-PCP-J]	**VU**	6	R/W	C	0: No alarm function 1: Alarm 1/TI alarm 1 2: Alarm 2/TI alarm 2 3: Burnout 4: Heater break alarm (HBA) 5: Temperature rise completion output 6: AI alarm 1 7: AI alarm 2 8: Control loop break alarm (LBA) 9: FAIL output 10: PLC communication status [Action] 1 to 4, 6 to 8: Closed at alarm occurrence 5: Closed at temperature rise completion 9: Open at fail occurrence 10: Closed at communication with PLC Be action of energized case. Action reverses in case of de-energized. (For the energize/de-energized, see H-PCP-J module DO de-energized selection.)	CH1: 9 CH2: 1 CH3: 2 CH4: 3 CH5: 4 CH6: 5 CH7: 8 CH8: 10

* For the ZK-1103 specification, the factory set value is 1 (Unit of input range).

■ Event output function

The event output function enables up to eight points to be output per module of unique alarms different from ordinary temperature and AI alarms (Extension alarm output function), control unit operations (Status output function) and comparison results which are output only under certain conditions (Data comparison output function). The function can be set for each channel of the H-DO-C module.

● Extension alarm output function

An extension alarm is output independently of H-TIO-□ module alarms. As it is independently set, it can be provided as a dedicated alarm output.

Event DO function selection (Identifier XF)		Event DO corresponding channel setting (Identifier XG)	Event DO mode select setting (Identifier XH)
Setting data	Function name		
10	Temperature deviation alarm	1 to 20 CH (H-TIO-□ module)	0: High alarm 1: Low alarm 2: High/low alarm 3: Band alarm 4: High alarm with hold action 5: Low alarm with hold action 6: High/low alarm with hold action 7: Band alarm with hold action 8: High alarm with re-hold action 9: Low alarm with re-hold action 10: High/low alarm with re-hold action
	Motor speed deviation alarm	1 to 20 CH (H-SIO-A module)	
11	Temperature process alarm	1 to 20 CH (H-TIO-□ module)	0: High alarm 1: Low alarm 2: High alarm with hold action 3: Low alarm with hold action
	Motor speed process alarm	1 to 20 CH (H-SIO-A module)	
12	Temperature set value alarm	1 to 20 CH (H-TIO-□ module)	0: High alarm 1: Low alarm
	Motor speed set value alarm	1 to 20 CH (H-SIO-A module)	
13	AI process alarm	1 to 40 CH (H-AI-□ module)	0: High alarm 1: Low alarm 2: High alarm with hold action 3: Low alarm with hold action
20	TI process alarm	1 to 40 CH (H-TI-□ module)	0: High alarm 1: Low alarm 2: High alarm with hold action 3: Low alarm with hold action

This output is different from the ordinary alarm output from the H-DO-A/B type module. Similarly, the ordinary alarm cannot be output from the H-DO-C type module (for event output).

The alarm differential gap and alarm delay timer are commonly set.

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- **Status output function**

This function is used to output the control unit action status other than the extension alarm output in addition to the ordinary alarm output status (Alarm 1 status, etc.).

Event DO function selection (Identifier XF)		Event DO corresponding channel setting (Identifier XG)	Event DO mode select setting (Identifier XH)
Setting data	Function name		
0	Unused (Manual mode)	—	—
1	Alarm 1	1 to 20 CH (H-TIO-☐/H-SIO-A module)	—
2	Alarm 2	1 to 20 CH (H-TIO-☐/H-SIO-A module)	—
3	Burnout	1 to 20 CH (H-TIO-☐ module)	—
4	Heater break alarm (HBA)	1 to 20 CH (H-TIO-☐ module)	—
5	AI alarm 1	1 to 40 CH (H-AI-☐ module)	—
6	AI alarm 2	1 to 40 CH (H-AI-☐ module)	—
7	Control loop break alarm (LBA)	1 to 20 CH (H-TIO-☐ module)	—
8	PID/AT	1 CH	—
17	TI alarm 1	1 to 40 CH (H-TI-☐ module)	—
18	TI alarm 2	1 to 40 CH (H-TI-☐ module)	—
19	TI burnout	1 to 40 CH (H-TI-☐ module)	—
22	Event DI logic output status	1 to 40 CH (H-DI-B module)	—
9	Not settable	—	—
23 to 30	Not settable	—	—

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- **Data comparison output function**

This function is used to output the result of comparison between the measured value and measured value (or set value and set value) within the same group.

Event DO function selection (Identifier XF)		Event DO corresponding channel setting (Identifier XG)	Event DO mode select setting (Identifier XH)
Setting data	**Function name**	**Data 1**	**Data 2**
14	**Temperature measured value comparison** Comparison between the temperature measured value and temperature measured value	1 to 20 CH (H-TIO-☐ module)	1 to 20 CH (H-TIO-☐ module)
	Motor speed measured value comparison Comparison between the motor speed measured value and motor speed measured value	1 to 20 CH (H-SIO-A module)	1 to 20 CH (H-SIO-A module)
15	**Temperature set value comparison** Comparison between the temperature set value and temperature set value	1 to 20 CH (H-TIO-☐ module)	1 to 20 CH (H-TIO-☐ module)
	Motor speed set value comparison Comparison between the motor speed set value and motor speed set value	1 to 20 CH (H-SIO-A module)	1 to 20 CH (H-SIO-A module)
16	**AI measured value comparison** Comparison between the AI measured value and AI measured value	1 to 40 CH (H-AI-☐ module)	1 to 40 CH (H-AI-☐ module)
21	**TI measured value comparison** Comparison between the TI measured value and TI measured value	1 to 40 CH (H-TI-☐ module)	1 to 40 CH (H-TI-☐ module)

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[Relationship between output and comparison]

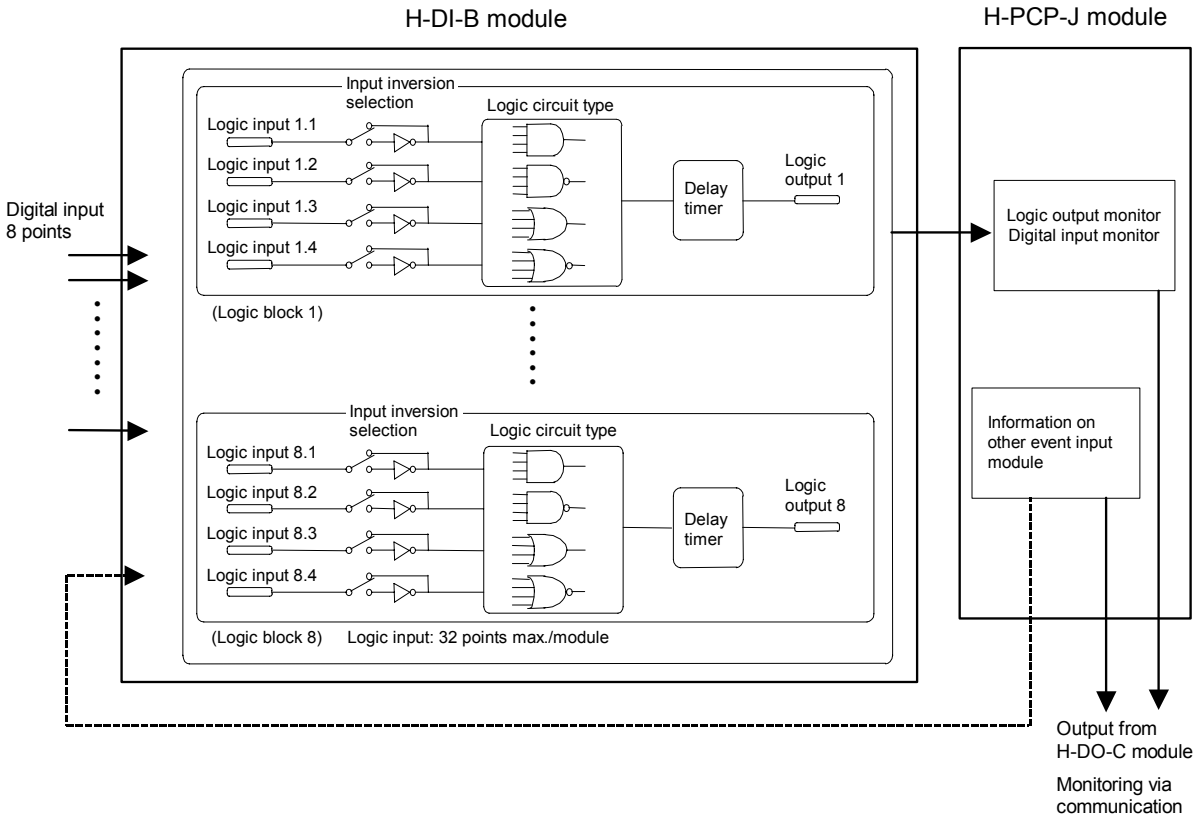
Computing equation:
The output turns ON at (Data 2) − (Data 1) ≤ 0

This means :
The output turns ON if (Data 2) is smaller than or equal to (Data 1). {Data 2 ≤ Data 1}
The output turns OFF if (Data 2) is larger than (Data 1). {Data 2 > Data 1}

■ Logic input function

Each logic is built by four event inputs. Up to eight logic results (logic outputs) per H-DI-B module can be monitored through communication or can be output from H-DO-C module. In addition, this function can assign the input of the H-DI-B module to any channel number of the H-DO-C module to output the result.

The logic section of event DI module consists of 4 logic input points, input reversal selection, logic circuit type selection, input delay timer and logic output.



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Event DI type selection (Identifier R1 to R4)		Event DI corresponding channel selection (Identifier E1 to E4)	Note
Setting data	Description		
0	Input always OFF	—	Always ON at "Reversal" selection
1	Event DI input	1 to 80	0: OFF 1: ON
2	Event DI logic output	1 to 80	0: OFF 1: ON
3	Event DO output	1 to 72	0: OFF 1: ON
4	PCP error code	—	0: Not provided 1: Provided
5	Temperature rise completion	—	0: Rise not complete 1: Rise completed
6	PID/AT logical *OR*	—	0: All PID 1: Any one is in AT
7	Alarm 1	1 to18	0: OFF 1: ON
8	Alarm 2	1 to18	0: OFF 1: ON
9	Burnout	1 to18	0: OFF 1: ON
10	Heater break alarm (HBA)	1 to18	0: OFF 1: ON
11	Control loop break alarm (LBA)	1 to18	0: OFF 1: ON
12	AI alarm 1	1 to 36	0: OFF 1: ON
13	AI alarm 2	1 to 36	0: OFF 1: ON
14	TI alarm 1	1 to 36	0: OFF 1: ON
15	TI alarm 2	1 to 36	0: OFF 1: ON
16	TI burnout	1 to 36	0: OFF 1: ON
17 to 30	Not settable	—	—

Each contact status can be monitored by the following identifier.

Digital input (1 to 8) → Event DI contact input monitor (Identifier L4)
Logic input (1 to 4)/Logic section → Event DI logic input monitor (Identifier L5)
Logic input (1 to 8) → Event DI logic output monitor (Identifier Q5)

For identifier L4, L5 and Q5, see **6.2 Communication Identifier List (P. 65)**.

■ Positioning adjustment counter

Item	Setting data (Setting counter value)	Description	Status
Opening adjustment	0	Normal status	
	1	Opening adjustment star, open-side output start (Motor time: 110 %)	Automatic
	2	Capture the open-side opening value after 3 seconds stop	
	3	Close-side output start (Motor time: 110 %)	
	4	Capture the close-side opening value after 3 seconds stop	
	5	Above data stored in H-TIO-K module	
	6	Hold status	
Capture the motor time	7	Outputs the close-side until the positioning becomes 0 %. Open-side output start if the positioning is less than 0 %. Stops at an positioning of more than 100 %, and capture the motor time by H-TIO-K module	Automatic
	8	After the motor time has been captured, close-side output comes ON (Motor time : 110 %)	
	9	Hold status	
–	10 to 100	Not settable	

When you input setting counter 1, the opening adjustment starts, operations are carried out automatically up to setting counter 6, then the system goes on hold status. When you input setting counter 7, the motor time capture starts, operations are carried out automatically up to setting counter 9, then the system goes on hold status. After the settings are complete, always set to "0: Normal status."

■ Input range table

Thermocouple input (H-TIO-A/B/C/D/E/G/K/P/R, H-TI-B/C, H-CIO-A)

Input type		Range No.
K	0 to 400 °C	0
	0 to 800 °C	1
	0 to 1300 °C	2
	0.0 to 400.0 °C	46
	0.0 to 800.0 °C	47
	0.0 to 1300.0 °C [1]	80
	0 to 800 °F	3
	0.0 to 800.0 °F	48
	0 to 2400 °F	4
	0.0 to 2400.0 °F [1]	81
	−200.0 to +300.0 °C [1]	64
	−100.0 to +400.0 °C [2]	67
J	0 to 400 °C	5
	0 to 800 °C	6
	0 to 1200 °C	7
	0.0 to 400.0 °C	49
	0.0 to 800.0 °C	50
	0.0 to 1200.0 °C [1]	82
	0 to 1600 °F	8
	0.0 to 700.0 °F	51
	0 to 2100 °F	9
	0.0 to 1600.0 °F [1]	83
	−200.0 to +300.0 °C [1]	65
R	0 to 1700 °C	10
	0.0 to 1700.0 °C [1]	84
	0 to 3000 °F	11
S	0 to 1700 °C	12
	0.0 to 1700.0 °C [1]	85
	0 to 3000 °F	13
B [3]	0 to 1800 °C	14
	0.0 to 1800.0 °C [1]	86
	0 to 3000 °F	15
E	0 to 1000 °C	17
	0.0 to 700.0 °C	52
	0 to 400 °C	16
	0.0 to 400.0 °C [1]	87
	0.0 to 1000.0 °C [1]	88
	0 to 1800 °F	18
	0.0 to 1800.0 °F [1]	89

Input type		Range No.
T	0.0 to 400.0 °C	53
	0 to 400 °C	20
	0 to 200 °C	19
	−200 to +200 °C	21
	0.0 to 200.0 °C [1]	90
	−200.0 to +200.0 °C [1]	91
	0.0 to 700.0 °F	54
	0 to 700 °F	22
	−300 to +400 °F	23
	−300.0 to +400.0 °F [1]	92
N	0 to 1300 °C	24
	0.0 to 1300.0 °C [1]	93
	0 to 2300 °F	25
	0.0 to 2300.0 °F [1]	94
PL II	0 to 1200 °C	26
	0.0 to 1200.0 °C [1]	95
	0 to 2300 °F	27
	0.0 to 2300.0 °F [1]	96
W5Re/ W26Re	0 to 2300 °C	28
	0.0 to 2300.0 °C [1]	97
	0 to 3000 °F	29
U	0.0 to 600.0 °C	55
	0 to 400 °C	30
	−200 to +200 °C	31
	0.0 to 400.0 °C [1]	98
	−200.0 to +200.0 °C [1]	99
	0 to 700 °F	32
	−300 to +400 °F	33
	0.0 to 700.0 °F [1]	100
	−300.0 to +400.0 °F [1]	101
L	0 to 400 °C	34
	0.0 to 400.0 °C	56
	0.0 to 900.0 °C	57
	0 to 900 °C	35
	0 to 800 °F	36
	0 to 1600 °F	37
	0.0 to 800.0 °F [1]	102
	0.0 to 1600.0 °F [1]	103

[1] The range can be specified only by H-TIO-E/G/R, H-TI-B or H-CIO-A module (high accuracy type).

[2] The range can be specified only by H-TIO-A/B/C/D [Z-1013 specification] or H-TI-C module [Z-1013 specification].

[3] Accuracy is not guaranteed between 0 to 399 °C (0 to 799 °F) for type B thermocouple input.

RTD input (H-TIO-A/B/C/D/E/F/G/K/P/R, H-TI-A/B, H-CIO-A)

Input type		Range No.
JPt100	0.0 to 400.0 °C	59
	0 to 400 °C	38
	−200 to +200 °C	39
	−200.0 to +200.0 °C	58
	−50.00 to +150.00 °C [1]	106
	−300 to +900 °F	41
	0 to 800 °F	40
	0.0 to 800.0 °F	60
	−300.0 to +900.0 °F [2]	104
Pt100	0.0 to 400.0 °C	62
	0 to 400 °C	42
	−200 to +200 °C	43
	−200.0 to +200.0 °C	61
	−50.00 to +150.00 °C [1]	107
	−300 to +1200 °F	45
	0 to 800 °F	44
	0.0 to 800.0 °F	63
	−300.0 to +1200.0 °F [2]	105

[1] The range with the resolution of 1/100 can be specified only by H-TIO-E module.
[2] The range can be specified only by H-TIO-F module (high accuracy type).

Current input and Voltage input (H-TIO-H/J, H-CIO-A)

Input type			Range No.	Input group
Voltage input *	0 to 10 mV DC	0.0 to 100.0 %	0	Voltage (low) input group
	−10 to +10 mV DC	0.0 to 100.0 %	1	
	0 to 100 mV DC	0.0 to 100.0 %	2	
	−100 to +100 mV DC	0.0 to 100.0 %	3	
	0 to 1 V DC	0.0 to 100.0 %	4	
	−1 to +1 V DC	0.0 to 100.0 %	5	
	0 to 5 V DC	0.0 to 100.0 %	6	
	1 to 5 V DC	0.0 to 100.0 %	7	
	−5 to +5 V DC	0.0 to 100.0 %	8	
	0 to 10 V DC	0.0 to 100.0 %	9	Voltage (high) input group
	−10 to +10 V DC	0.0 to 100.0 %	10	
Current input *	0 to 20 mA DC	0.0 to 100.0 %	11	Current input group
	4 to 20 mA DC	0.0 to 100.0 %	12	

* Display scale of the current and voltage input can be changed.

An input type change may only be made within the input groups as shown above.

Pulse input (H-SIO-A)

Input type		Range No.
Pulse input	• Dry contact input (Power supply for sensor, 12 V DC) • Voltage input (Power supply for sensor, 12 V DC) Specify when ordering with model code.	0

Do not set any number other than 0, as this may cause malfunction.

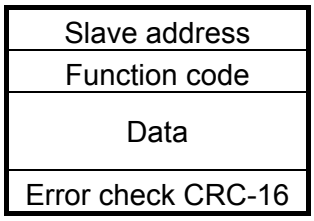
7. MODBUS

7.1 Protocol

The master controls communication between master and slave. A typical message consists of a request (query message) sent from the master followed by an answer (response message) from the slave. When master begins data transmission, a set of data is sent to the slave in a fixed sequence. When it is received, the slave decodes it, takes the necessary action, and returns data to the master.

7.1.1 Message format

The message consists of four parts: slave address, function code, data, and error check code which are always transmitted in the same sequence.



Message format

■ Slave address

The slave address is a number from 1 to 16 manually set at the slave address setting switch located at the front of the H-PCP-J module. Although all connected slave units receive the query message sent from the master, only the slave with the slave address coinciding with the query message will accept the message.

■ Function code

The function codes are the instructions set at the master and sent to the slave describing the action to be executed. The function codes are included when the slave responds to the master.

☞ For details, see **7.1.2 Function code (P. 110)**.

■ Data

The data to execute the function specified by the function code is sent to the slave and corresponding data returned to the master from the slave.

☞ For details, see **7.2 Message Format (P. 115)**, **7.3 Communication Data (P. 119)** and **7.4 Data Map (P. 154)**.

■ Error check

An error checking code (CRC-16: Cyclic Redundancy Check) is used to detect an error in the signal transmission.

☞ For details, see **7.1.5 Calculating CRC-16 (P. 112).**

7.1.2 Function code

- **Function code contents**

Function code (Hexadecimal)	Function	Contents
03H	Read holding registers	Measured value, control output value, Current transformer input measured value, alarm status, etc.
06H	Preset single register	Set value, PV bias, PID constants, alarm set value, etc.
08H	Diagnostics (loopback test)	Loopback test
10H	Preset multiple registers	Set value, PV bias, PID constants, alarm set value, etc.

- **Message length of each function (Unit: byte)**

Function code (Hexadecimal)	Function	Query message		Response message	
		Min	Max	Min	Max
03H	Read holding registers	8	8	7	255
06H	Preset single register	8	8	8	8
08H	Diagnostics (loopback test)	8	8	8	8
10H	Preset multiple registers	11	209	8	8

7.1.3 Communication mode

Signal transmission between the master and slaves is conducted in Remote Terminal Unit (RTU) mode.

RTU mode

Items	Contents
Data bit length	8-bit (Binary)
Start mark of message	Unused
End mark of message	Unused
Message length	See **7.1.2 Function code**
Data time interval	Less than 24 bits' time *
Error check	CRC-16 (Cyclic Redundancy Check)

* When sending a command message from the master, set intervals of data configuring one message to time shorter than the 24 bits' time (for Modbus mode 1) or the 24 bits' time plus 2 ms (for Modbus mode 2). If time intervals become time longer than the 24 bits' time (for Modbus mode 1) or the 24 bits' time plus 2 ms (for Modbus mode 2), the relevant slave assumes that message sending from the master is terminated to deform the message format. As a result, the slave does not make a response.

7.1.4 Slave responses

(1) Normal response

- In the response message of the Read Holding Registers, the slave returns the read out data and the number of data items with the same slave address and function code as the query message.
- In the response message of the Preset Single Register and Diagnostics (Loopback test), the slave returns the same message as the query message.
- In the response message of the Preset Multiple Registers, the slave returns the slave address, the function code, starting number, and number of holding registers in the multi-query message.

(2) Defective message response

- If the query message from the master is defective, except for transmission error, the slave returns the error response message without any action.
- If the self-diagnostic function of the slave detects an error, the slave will return an error response message to all query messages.
- The function code of each error response message is obtained by adding 80H to the function code of the query message.

Slave address
Function code
Error code
Error check CRC-16

Error response message

Error code	Contents
1	Function code error (An unsupported function code was specified)
2	When written to *read only* data When any address other than 0000H to 1FFFH is specified
3	When the data written exceeds the setting range When the specified number of data items in the query message exceeds the maximum number of data items available

(3) No response

The slave ignores the query message and does not respond when:

- The slave address in the query message does not coincide with any slave address settings.
- The transmission parameter of the master does not coincide with that of the slave.
- Transmission error such as overrun, framing, parity and etc., is found in the query message.
- If data time interval in the query message from the master is following
  Modbus mode 1: 24 bits' time or more
  Modbus mode 2: 24 bits' time + 2 ms or more

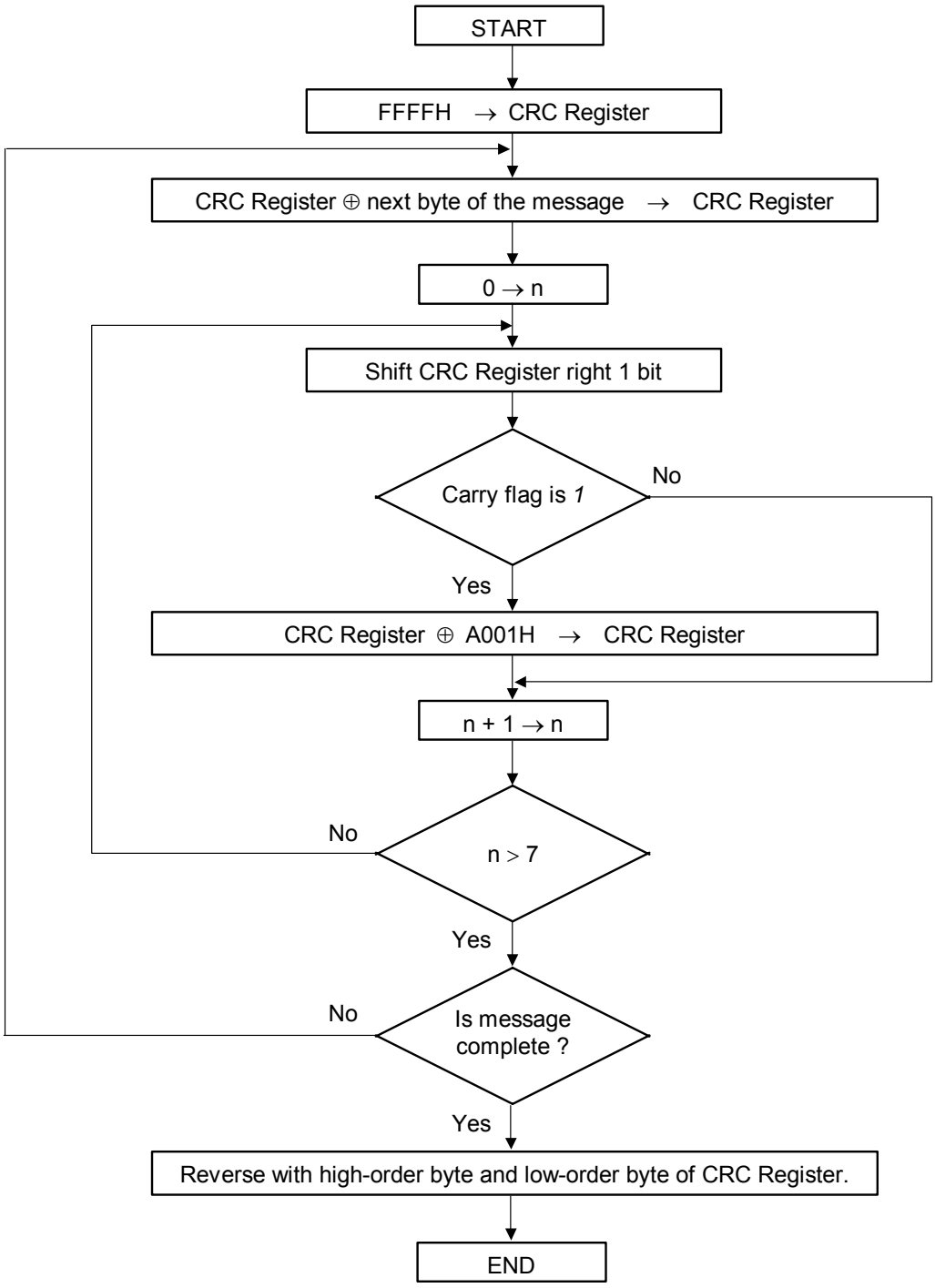
7.1.5 Calculating CRC-16

The Cyclic Redundancy Check (CRC) is a 2 byte (16-bit) error check code. After constructing the data message, not including start, stop, or parity bit, the master calculates a CRC code and appends this to the end of the message. The slave will calculate a CRC code from the received message, and compare it with the CRC code from the master. If they do not coincide, a communication error has occurred and the slave does not respond.

The CRC code is formed in the following sequence:

1. Load a 16-bit CRC register with FFFFH.
2. *Exclusive OR* (⊕) the first byte (8-bit) of the message with the CRC register. Return the result to the CRC register
3. Shift the CRC register 1-bit to the right.
4. If the carry flag is 1, *exclusive OR* the CRC register with A001 hexadecimal and return the result to the CRC register. If the carry flag is 0, repeat step ***3***.
5. Repeat step ***3*** and ***4*** until there have been 8 shifts.
6. *Exclusive OR* the next byte (8-bit) of the message with the CRC register.
7. Repeat step ***3*** through ***6*** for all bytes of the message (except the CRC).
8. The CRC register contains the 2 byte CRC error code. When they are appended to the message, the low-order byte is appended first, followed by the high-order byte.

■ The flow chart of CRC-16



The ⊕ symbol indicates an *exclusive OR* operation. The symbol for the number of data bits is *n*.

■ Example of a CRC calculation in the ‘C’ language

This routine assumes that the data types ‘uint16’ and ‘uint8’ exists. Theses are unsigned 16-bit integer (usually an ‘unsigned short int’ for most compiler types) and unsigned 8-bit integer (unsigned char). ‘z_p’ is a pointer to a Modbus message, and z_messaage_length is its length, excluding the CRC. Note that the Modbus message will probably contain NULL characters and so normal C string handling techniques will not work.

```
uint16 calculate_crc (byte *z_p, unit16 z_message_length)

/* CRC runs cyclic Redundancy Check Algorithm on input z_p  */
/* Returns value of 16-bit CRC after completion and         */
/* always adds 2 crc bytes to message                       */
/* returns 0 if incoming message has correct CRC            */

{
    uint16 CRC= 0xffff;
    uint16 next;
    uint16 carry;
    uint16 n;
    uint8 crch, crcl;

    while (z_messaage_length--) {
        next = (uint16) *z_p;
        CRC ^= next;
        for (n = 0; n < 8; n++) {
            carry = CRC & 1;
            CRC >>= 1;
            if (carry) {
              CRC ^= 0xA001;
            }
        }
        z_p++;
    }
    crch = CRC / 256;
    crcl = CRC % 256
    z_p [z_messaage_length++] = crcl;
    z_p [z_messaage_length] = crch;
    return CRC;
}
```

7.2 Message Format

7.2.1 Read holding registers [03H]

The query message specifies the starting register address and quantity of registers to be read.
The contents of the holding registers are entered in the response message as data, divided into two parts: the high-order 8-bit and the low-order 8-bit, arranged in the order of the register numbers.

Example: The contents of the three holding registers from 006BH to 006DH are the read out from slave address 2.

Query message

Slave address		02H
Function code		03H
Starting No.	High	00H
	Low	6BH
Quantity	High	00H
	Low	03H
CRC-16	High	74H
	Low	24H

→ First holding register address

→ The setting must be between 1 (0001H) and 125 (007DH).

Normal response message

Slave address		02H
Function code		03H
Number of data		06H
First holding register contents	High	02H
	Low	2BH
Next holding register contents	High	00H
	Low	00H
Next holding register contents	High	00H
	Low	63H
CRC-16	High	50H
	Low	48H

→ Number of holding registers × 2

Error response message

Slave address		02H
80H + Function code		83H
Error code		03H
CRC-16	High	F1H
	Low	31H

7.2.2 Preset single register [06H]

The query message specifies data to be written into the designated holding register. The write data is arranged in the query message with high-order 8-bit first and low-order 8-bit next. Only R/W holding registers can be specified.

Example: Data is written into the holding register 00C8H of slave address 1.

Query message

Slave address		01H
Function code		06H
Holding register number	High	00H
	Low	C8H
Write data	High	00H
	Low	64H
CRC-16	High	09H
	Low	DFH

→ Any data within the range

Normal response message

Slave address		01H
Function code		06H
Holding register number	High	00H
	Low	C8H
Write data	High	00H
	Low	64H
CRC-16	High	09H
	Low	DFH

→ Contents will be the same as query message data

Error response message

Slave address		01H
80H + Function code		86H
Error code		03H
CRC-16	High	02H
	Low	61H

7.2.3 Diagnostics (Loopback test) [08H]

The master's query message will be returned as the response message from the slave.
This function checks the communication system between the master and slave (SR Mini HG SYSTEM control unit).

Example: Loopback test for slave address 1

Query message

Slave address		01H
Function code		08H
Test code	High	00H
	Low	00H
Data	High	1FH
	Low	34H
CRC-16	High	E9H
	Low	ECH

→ Test code must be set to "00"

→ Any pertinent data

Normal response message

Slave address		01H
Function code		08H
Test code	High	00H
	Low	00H
Data	High	1FH
	Low	34H
CRC-16	High	E9H
	Low	ECH

→ Contents will be the same as query message data

Error response message

Slave address		01H
80H + Function code		88H
Error code		03H
CRC-16	High	06H
	Low	01H

7.2.4 Preset multiple registers [10H]

The query message specifies the starting register address and quantity of registers to be written.
The write data is arranged in the query message with high-order 8-bit first and low-order 8-bit next.
Only R/W holding registers can be specified.

Example: Data is written into the two holding registers from 00C8H to 00C9H of slave address 1.

Query message

Slave address		01H	
Function code		10H	
Starting number	High	00H	→ First holding register address
	Low	C8H	
Quantity	High	00H	→ The setting must be between 1 (0001H) and 100 (0064H).
	Low	02H	
Number of data		04H	→ Number of holding registers × 2
Data to first register	High	00H	
	Low	64H	
Data to next register	High	00H	
	Low	64H	
CRC-16	High	BEH	
	Low	6DH	

Normal response message

Slave address		01H
Function code		10H
Starting number	High	00H
	Low	C8H
Quantity	High	00H
	Low	02H
CRC-16	High	C0H
	Low	36H

Error response message

Slave address		01H
80H + Function code		90H
Error code		02H
CRC-16	High	CDH
	Low	C1H

7.3 Communication Data

7.3.1 Data configuration

The numeric range of data used in Modbus protocol is 0000H to FFFFH. Only the set value within the setting range is effective.

FFFFH represents −1.

Data processing with decimal points

■ Data with decimal points

The Modbus protocol does not recognize data with decimal points during communication.

- **Data with 1 digit below decimal point**

Heat-side manipulated output
Cool-side manipulated output
Heat-side proportional band
Cool-side proportional band
Overlap/deadband
Current transformer input measured value 1 (H-TIO-A/C/D)
Current transformer input measured value 2 (H-CT-A module)
Heater break alarm set value 1 (H-TIO-A/C/D)
Heater break alarm set value 2 (H-CT-A module)
Manual output value
Setting change rate limiter
Output limiter (high)
Output limiter (low)
Output change rate limiter (up)
Output change rate limiter (down)
Digital filter
H-SIO-A gate time
H-DO-G manipulated output value
H-DO-G output limiter (high)
H-DO-G output limiter (low)
H-DO-G manual output value
Manipulated output value at input error
Start determination point
Positioning monitor
Positioning output neutral zone
Manual positioning output value
Integrated output limiter
AI digital filter
TI digital filter
AO zooming high limit
AO zooming low limit
AO output change rate limiter

- **Data with 2 digits below decimal point**

PV bias
H-SIO-A control range
Cascade bias
ON/OFF control differential gap (upper)
ON/OFF control differential gap (lower)
Alarm 1 differential gap
Alarm 2 differential gap
AI alarm 1 differential gap
AI alarm 2 differential gap
TI PV bias
TI alarm 1 differential gap
TI alarm 2 differential gap
AO zero point correction
AO full scale correction
Event DO extension alarm differential gap

- **Data with 3 digits below decimal point**

  H-DO-G output ratio set value Cascade gain

Example: When heater break alarm set value 1 is 20.0 A, 20.0 is processed as 200, 200 = C8H

Heater break alarm set value 1	High	00H
	Low	C8H

■ Data without decimal points

Status
Error code
Overall alarm status
Temperature rise completion status
PID/AT transfer
Integral time
Derivative time
Control response parameter
Operation mode transfer
Heat-side proportioning cycle time
Cool-side proportioning cycle time
Auto/Manual transfer
LBA use selection
LBA time
Temperature rise completion trigger
CT channel setting
Control RUN/STOP transfer
Memory area number
Temperature rise completion soak time
Module initialization
Alarm interlock release
Cascade ON/OFF
Motor time
H-SIO-A input frequency at full scale
H-SIO-A correction trigger
H-SIO-A measuring method
H-SIO-A divide ratio
H-SIO-A auto zero time
H-SIO-A open/closed loop control transfer
H-SIO-A alarm hold cancel time
Decimal point position
Input range number
Action at input error (high)
Action at input error (low)
Direct/Reverse action selection
Hot/Cold start selection
Control RUN/STOP holding
Temperature rise completion hold function
Interval time setting
PLC scanning time setting
Power supply frequency selection
H-PCP-J module DO de-energized selection
HBA trigger points
PV bias unit selection
Integral time limiter at AT end
Alarm 1 type selection
Alarm 2 type selection
Alarm 1 hold action
Alarm 2 hold action
Alarm 1 interlock
Alarm 2 interlock
Alarm 1 action at input error
Alarm 2 action at input error
Number of alarm delay times
DO function selection
DI function selection
DI using selection
H-PCP-J module DO type selection
Cascade tracking
Cascade data selection
Cascade DI function selection

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DI process selection
Positioning adjustment counter
Heater break alarm status (H-CT-A)
H-DI-A module input status
H-DO-G output cycle time
H-DO-G master channel setting
H-DO-G Auto/Manual transfer
AI status
AI zero point correction
AI full scale correction
AI operation mode transfer
AI input range number
AI decimal point position
AI moving average
AI alarm 1 type selection
AI alarm 2 type selection
AI alarm 1 hold action
AI alarm 2 hold action
AI alarm 1 interlock
AI alarm 2 interlock
Number of AI alarm delay times
TI status
TI operation mode transfer
TI input range number
TI alarm 1 type selection
TI alarm 2 type selection
TI alarm 1 hold action
TI alarm 2 hold action
TI alarm 1 interlock
TI alarm 2 interlock
Number of TI alarm delay times
AO function selection
AO corresponding channel setting
AO decimal point position
Event DI contact input monitor
Event DI logic input monitor
Event DI logic output monitor
Event DI type selection 1 to 4
Event DI corresponding channel selection 1 to 4
Event DI reversal selection 1 to 4
Event DI logic circuit selection
Event DI delay timer setting
Event DO status
Event DO manual output value
Event DO function selection
Event DO corresponding channel setting
Event DO mode select setting
Event DO extension alarm interlock
Number of Event DO extension alarm delay times

Example: When integral time is 50 seconds, 50 = 32H

Integral time	High	00H
	Low	32H

■ Data whose decimal point's presence and/or position depends on input range

The position of the decimal point changes depending on the input range type because the Modbus protocol does not recognize data with decimal points during communication.
The following data can have one of three decimal point positions:

No digit below decimal point, 1 digit below decimal point, 2 digits below decimal point

☞ For details, see **Input range table (P. 107).** The input range for voltage/current input (H-TIO-H/J module) and H-SIO-A module is fixed at 0.0 to 100.0 %.

Temperature measured value (PV)
Motor speed measured value (H-SIO-A)
Temperature set value (SV)
Motor speed set value (H-SIO-A)
Set value monitor
Alarm 1 set value
Alarm 2 set value
LBA deadband
Temperature rise completion range
Display scale high
(H-TIO-H/J, H-CIO-A, H-SIO-A)
Display scale low
(H-TIO-H/J, H-CIO-A, H-SIO-A)
H-SIO-A output scale high
H-SIO-A output scale low
H-SIO-A correction actual measured value
Setting limiter (high)
Setting limiter (low)
Input error determination point (high)
Input error determination point (low)
AT bias
Cascade monitor
AI measured value
AI alarm 1 set value
AI alarm 2 set value
AI display scale high
AI display scale low
TI measured value
TI alarm 1 set value
TI alarm 2 set value
AO output value monitor
AO output set value
AO display scale high
AO display scale low
Event DO extension alarm set value

Example: When the temperature set value is -20.0 °C, -20.00 is processed as -200,
-200 = 0000H - 00C8H = FF38H

Temperature set value	High	FFH
	Low	38H

7.3.2 Data processing precautions

- With Modbus protocol, the maximum number of channels per slave address is 20.
- The accessible data (holding register) address range is from 0000H to 1FFFH.
  If data exceeding the 1FFFH is accessed, an error response message is returned.
- Do not write data to any address which is not described in a list of data maps.
- Initialize the module after changing to stop the control.
- Read data of unused channel and undefined address is “0.”
- Any attempt to write to an unused channel is not processed as an error. Data can not be written into an unused channel.
- If data range or address error occurs during data writing, the data written before error is in effect.
- Some communication data may become invalid depending on the module selection or the configuration of the SR Mini HG SYSTEM control unit.
  If any one of the conditions listed below occurs and data items written are within the setting range, read data becomes “0.” Under these conditions, no error response message will occur.
  - When heat/cool control, manual output value and auto/manual transfer are invalid.
  - When heat control, cool-side manipulated output, cool-side proportional band, overlap/deadband and cool-side proportioning cycle time are invalid.
  - When ON/OFF control, cool-side manipulated output, heat-side and cool-side proportional band, integral time, derivative time, overlap/deadband and cool-side proportioning cycle time are invalid.
  - When current/voltage output , heat-side and cool-side proportioning cycle time are invalid.
  - When only the heater break alarm function is provided, current transformer input measured value ,
    current transformer input measured value 2, heater break alarm status, heater break alarm set value 1 and heater break alarm set value 2 are valid.
  - When only the control loop break alarm (LBA) function is provided, control loop break alarm (LBA) status, use selection, time and deadband are valid.

7.3.3 Communication data list

- Name
  ◆: Item stored in the memory area.
  [ ]: The functional module name that data becomes valid is written.
- Attributes
  RO: Read only Slave (SR Mini HG SYSTEM) → Master
  R/W: Read and Write Slave (SR Mini HG SYSTEM) ↔ Master
  WO: Write only Slave (SR Mini HG SYSTEM) ← Master
- Structure
  C: Data for each channel L: Data for each event input logic circuit
  M: Data for each module U: Data for each unit address

Name	Attri-bute	Struc-ture	Data range	Factory set value
Temperature measured value (PV) [H-TIO-☐, H-CIO-A]	RO	C	TC/RTD input: Within input range Current/voltage input: Within display scale range	—
Motor speed measured value [H-SIO-A]	RO	C	Within display scale range	—
Heat-side manipulated output value [H-TIO-☐, H-CIO-A, H-SIO-A]	RO	C	−0.5 to +105.0 %	—
Cool-side manipulated output value [H-TIO-☐, H-CIO-A]	RO	C	−0.5 to +105.0 %	—
Current transformer input measured value 1 [H-TIO-A/C/D]	RO	C	0.0 to 100.0 A or 0.0 to 30.0 A Current transformer (CT) input measured value of the H-TIO-A/C/D module.	—
Current transformer input measured value 2 [H-CT-A]	RO	C	0.0 to 100.0 A or 0.0 to 30.0 A Current transformer (CT) input measured value of the H-CT-A module.	—

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Name	Attri-bute	Struc-ture	Data range	Factory set value
Status [H-TIO-□, H-CIO-A, H-SIO-A]	RO	C	The respective channel status is assigned to each bit in the holding register. bit 0: Alarm 1 status bit 1: Alarm 2 status bit 2: Burnout status bit 3: Heater break alarm status (*OR* operation of the H-TIO-□ module and H-CT-A module.) bit 4: Control loop break alarm (LBA) status bit 5: Temperature rise completion status bit 6: Heat-side manipulated output status bit 7 to 15: Unused Bit data 0: OFF 1: ON [Decimal number: 0 to 127] For H-SIO-A module, only alarm 1 status (bit 0), alarm 2 status (bit 1), heat-side manipulated output status (bit 6) are effective.	—
Temperature rise completion status [H-TIO-□, H-CIO-A]	RO	U	0: Rise not complete 1: Rise completed	—
Error code [H-PCP-J]	RO	U	0: Operations normal 1: Backup data check error 2: RAM read/write error 3: System structure error 4: Internal communications error 5: A/D converter error 6: Adjustment data error	—

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Name	Attri-bute	Struc-ture	Data range	Factory set value
Comprehensive alarm status [H-PCP-J]	RO	U	The respective channel status is assigned to each bit in the holding register. bit 0: Logical *OR* of alarm 1 status in all channels bit 1: Logical *OR* of alarm 2 status in all channels bit 2: Logical *OR* of burnout alarm status in all channels bit 3: Logical *OR* of heater break alarm status in all channels bit 4: Temperature rise completion status bit 5: Logical *OR* of AI alarm 1 status in all channels bit 6: Logical *OR* of AI alarm 2 status in all channels bit 7: Logical *OR* of control loop break alarm status in all channels bit 8: Logical *OR* of TI alarm 1 status in all channels bit 9: Logical *OR* of TI alarm 2 status in all channels bit 10: Logical *OR* of TI burnout alarm status in all channels bit 11 to 15: Unused Bit data 0: OFF 1: ON [Decimal number: 0 to 2047]	—
Set value monitor [H-TIO-□, H-CIO-A, H-SIO-A]	RO	C	TC/RTD input: Within input range Current/voltage input, H-SIO-A: Within display scale range	—
Temperature set value (SV) ◆ [H-TIO-□, H-CIO-A]	R/W	C	TC/RTD input: Within input range (Within setting limiter) Current/voltage input: Within display scale range (Within setting limiter)	0 *
Motor speed set value ◆ [H-SIO-A]	R/W	C	Within display scale range (Within setting limiter)	0 *

* The position of the decimal point differs depending on the input range.

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Name	Attri-bute	Struc-ture	Data range	Factory set value
PID/AT transfer * [H-TIO-□, H-CIO-A, H-SIO-A]	R/W	C	0: PID control operation 1: AT (Autotuning) operation	0

* Autotuning (AT) is the function which automatically measures, calculates and sets the optimum PID constants according to the set temperature.

Caution for using the Autotuning (AT)
When a temperature change (UP and/or Down) is 1C or less per minute during Autotuning, Autotuning may be cancelled before calculating PID values. In that case, adjust the PID values manually. It is possible to happen when the set value is around the ambient temperature or is close to the maximum temperature achieved by the load.

The following is the conditions necessary to carry out autotuning and the conditions which will cause the autotuning to stop.

Conditions necessary for autotuning:

The autotuning should be executed after satisfying all of the following conditions:

- Operation mode conditions:
  - Auto/Manual transfer → Auto mode
  - PID/AT transfer → PID control mode
  - Control RUN/STOP transfer → Control RUN mode
- The measured value (PV) is without input error range [Input error determination point (high) > Measured value (PV) > Input error determination point (low)].
- The output limiter high limit should be more than 0.1 % and the output limiter low limit should be less than 99.9 %.
- When operation mode is set to "Normal (Can be controlled)."

When the autotuning is finished, the display of each channel automatically returns to "0: PID control operation."

Conditions which will cause the autotuning to stop:

- When the temperature set value (SV) is changed.
- When the memory area is changed.
- When the PV bias value is changed.
- When the AT bias value is changed.
- When transfer to Manual mode using the Auto/Manual transfer.
- When the measured value (PV) goes to input error range [Measured value (PV) ≥ Input error determination point (high) or Input error determination point (low) ≥ Measured value (PV)].
- When the power is cut off.
- When FAIL occurs in the module whose channel is under the autotuning. Otherwise, when FAIL occurs in the H-PCP-J module.
- When transfer to the PID control mode by the PID/AT transfer.
- When operation mode is set to "Unused," "Monitor" or "Alarm."
- When the Control RUN/STOP function is changed to the "Control STOP" function.

When the above-mentioned conditions to stop the autotuning occurs, the autotuning is immediately stopped and switch over to the PID control mode. The PID constants return to the values at the start of the autotuning.

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Name	Attri-bute	Struc-ture	Data range	Factory set value
Heat-side proportional band ◆ [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	C	0.1 to 1000.0 % of span	H-TIO-☐, H-CIO-A: 3.0 H-SIO-A: 300.0
Cool-side proportional band ◆ [H-TIO-☐, H-CIO-A]	R/W	C	0.1 to 1000.0 % of span	3.0
Integral time ◆ [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	C	1 to 3600 seconds	H-TIO-☐, H-CIO-A: 240 H-SIO-A: 2
Derivative time ◆ [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	C	0 to 3600 seconds (0: PI action)	H-TIO-☐, H-CIO-A: 60 H-SIO-A: 0
Overlap/deadband ◆ [H-TIO-☐, H-CIO-A]	R/W	C	−10.0 to +10.0 % of span	0.0
Control response parameters ◆ [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	C	0: Slow 1: Medium 2: Fast In order to perform PID control by using the fuzzy function, specify “Fast.” The fuzzy function is effective to restrict overshoot or undershoot occurring at operation start, or resulting from set value changes. (Fuzzy function correspond to H-TIO-P/R module only.)	0 *

* Heat control (H-TIO-☐/H-CIO-A): 0 Heat/cool control (H-TIO-☐/H-CIO-A): 2
Position proportioning control (H-TIO-K): 0 Speed control (H-SIO-A): 0

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Name	Attri-bute	Struc-ture	Data range	Factory set value
Alarm 1 set value ◆ [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	C	TC/RTD input: Within input range or span range Current/voltage input, H-SIO-A: Within display scale range or span range	See Factory set value table of Alarm 1/ Alarm 2 set value *
Alarm 2 set value ◆ [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	C		
Heater break alarm set value 1 [H-TIO-A/C/D]	R/W	C	0.0 to 100.0 A or 0.0 to 30.0 A For the current transformer (CT) input of the H-TIO-A/C/D module.	0.0
Heater break alarm set value 2 [H-CT-A]	R/W	C	0.0 to 100.0 A or 0.0 to 30.0 A For the current transformer (CT) input of the H-CT-A module.	0.0
Operation mode transfer [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	C	0: Unused If set to "Unused," no control, monitor or alarm monitor is performed. 1: Monitor If set to "Monitor," only the monitor is performed. No control or alarm monitor is performed. 2: Alarm If set to "Alarm," monitor or alarm monitor is performed. No control is performed. 3: Normal Selected to normal mode to perform control, monitor or alarm monitor.	3

* Factory set value table of Alarm 1/Alarm 2 set value

Input type	Alarm type	Alarm 1 set value	Alarm 2 set value
TC/RTD input	Process high alarm	Input range (high limit)	Input range (high limit)
	Process low alarm	Input range (low limit)	Input range (low limit)
	Deviation high alarm, Deviation high/low alarm, Band alarm	50 °C	50 °C
	Deviation low alarm	–50 °C	–50 °C
	No alarm function	Input range (high limit)	Input range (low limit)
Current/voltage input	Process high alarm	100.0 %	100.0 %
	Process low alarm	0.0 %	0.0 %
	Deviation high alarm, Deviation high/low alarm, Band alarm	50 %	50 %
	Deviation low alarm	–50 %	–50 %
	No alarm function	100.0 %	0.0 %

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Name	Attri-bute	Struc-ture	Data range	Factory set value
Heat-side proportioning cycle time [H-TIO-□, H-CIO-A]	R/W	C	1 to 100 seconds Setting will be invalid in current/voltage output.	20 [a]
Cool-side proportioning cycle time [H-TIO-□, H-CIO-A]	R/W	C	1 to 100 seconds Setting will be invalid in current/voltage output and heat control.	20 [a]
Auto/Manual transfer [H-TIO-□, H-CIO-A]	R/W	C	0: Auto 1: Manual Setting will be invalid in ON/OFF control and heat/cool control.	0
Manual output value [H-TIO-□, H-CIO-A]	R/W	C	−5.0 to +105.0 % Setting will be invalid in ON/OFF control and heat/cool control. −105.0 to +105.0 % H-TIO-C/D [Z-1017 specification] : −105.0 to 0.0 % (cool-side) 0.0 to +105.0 % (heat-side)	0.0
LBA use selection [H-TIO-□, H-CIO-A]	R/W	C	0: Unused 1: Used	0
LBA time [H-TIO-□, H-CIO-A]	R/W	C	1 to 7200 seconds	480
LBA deadband [H-TIO-□, H-CIO-A]	R/W	C	Input span	0 [b]
PV bias [H-TIO-□, H-CIO-A, H-SIO-A]	R/W	C	−5.00 to +5.00 % of span ZK-1103 specification: −Input span to +Input span	0.00 ZK-1103: 0 [c]
Temperature rise completion range [H-TIO-□, H-CIO-A]	R/W	C	1 to 10 °C or 1 to 20 °F [b]	10 or 20 [b, d]

[a] Relay contact output: 20 seconds
Voltage pulse output, Open collector output, Triac output: 2 seconds

[b] The position of the decimal point differs depending on the input range.

[c] Unit (°C, °F, etc.) and decimal point position (No decimal place, One decimal place, Two decimal places or Three decimal places) depends on input range type.

[d] TC/RTD input: 10 °C or 20 °F
Current/voltage input: 10 % of display scale

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Name	Attri-bute	Struc-ture	Data range	Factory set value
Temperature rise completion trigger [H-TIO-□, H-CIO-A]	R/W	C	0: Unused 1: Used [1] Do not set "1: Used" in H-TIO-H/J module and H-SIO-A module, because temperature rise completion is not judged.	0
CT channel setting [H-CT-A]	R/W	C	0 to 20 (0: Unused) Allocates the channels for H-TIO-□ module to the input channels of H-CT-A module.	The factory set value varies depending on the specifications when ordering.
Control RUN/STOP transfer [H-PCP-J]	R/W	U	0: Control STOP 1: Control RUN	0
Memory area number [H-TIO-□, H-CIO-A, H-SIO-A]	R/W	U	1 to 8	1
Temperature rise completion soak time [H-TIO-□, H-CIO-A]	R/W	U	0 to 360 minutes	0
Module initialization [2] [H-PCP-J]	R/W	U	0: Normal state (Initialization is not executed) 1: Initialize only the new module (Only modules which are not recognized by the H-PCP-J module are initialized) 2: Initialize all modules Returns to 0 after the module is initialized.	0
Alarm interlock release [H-TIO-□, H-CIO-A, H-TI-□, H-AI-□]	WO	U	1: Release (1 only)	—

[1] If the channel of each of the H-TIO-H/J and H-SIO-A modules is set "1: Used," it does no reach the completion of temperature rise. As a result, the state of this completion (control unit) which is judged by performing the *OR* operation of all the channels cannot be attained, thereby continuing the incompletion of temperature rise.

[2] Initialize method for changing the module composition

To change module configuration, use the following procedures:

- When a module is added to the control unit.....Initialize only the new module
- When a module is deleted from the control unit .....Initialize only the new module
- When a module is inserted (Added) between the modules in the control unit .....Initialize all modules
- To change the arrangement of the modules in the control unit .....Initialize all modules

Note that when all modules are initialized all internal data of all modules are set to the default values.

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Name	Attri-bute	Struc-ture	Data range	Factory set value
Cascade ON/OFF [H-CIO-A]	R/W	C	0: OFF 1: ON Setting will be valid in master channel.	0
Cascade gain [H-CIO-A]	R/W	C	–9.999 to +10.000 As the cascade gain is valid only in the slave channel, the polling or selecting of the same value is made also in the master channel.	1.000
Cascade bias [H-CIO-A]	R/W	C	–99.99 to +100.00 % As the cascade bias is valid only in the slave channel, the polling or selecting of the same value is made also in the master channel.	–50.00
Positioning output neutral zone [H-TIO-K]	R/W	C	0.1 to 10.0 % of motor time	2.0
Motor time [H-TIO-K]	R/W	C	5 to 1000 seconds	10
Integrated output limiter [H-TIO-K]	R/W	C	100.0 to 200.0 % of motor time	150.0
Manual positioning output value [H-TIO-K]	R/W	C	–5.0 to +105.0 %	0.0
Setting change rate limiter ◆ [H-TIO-□, H-CIO-A, H-SIO-A]	R/W	C	0.0 to 100.0 % of span/minute	0.0
Output limiter (high) [For heat/cool control: Heat-side output limiter (high)] [H-TIO-□, H-CIO-A, H-SIO-A]	R/W	C	[Heat control, Position proportioning control and Speed control] Output limiter (low) to 105.0 % [Heat/cool control] Heat-side output limiter (high): –5.0 % to +105.0 % Heat-side output limiter (low): –5.0 % (fixed)	100.0 *

* Heat control (H-TIO-□/H-CIO-A): 100.0 Heat/cool control (H-TIO-□/H-CIO-A): 100.0
Position proportioning control (H-TIO-K): 100.0 Speed control (H-SIO-A): 100

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Name	Attri-bute	Struc-ture	Data range	Factory set value
Output limiter (low) [For heat/cool control: Cool-side output limiter (high)] [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	C	[Heat control, Position proportioning control and Speed control] −5.0 % to Output limiter (high) [Heat/cool control] Cool-side output limiter (high): −5.0 % to +105.0 % Cool-side output limiter (low): −5.0 % (fixed)	0.0 [a]
Output change rate limiter (up) [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	C	0.0 to 100.0 %/second (0.0: OFF) Setting will be invalid in ON/OFF control.	0.0
Output change rate limiter (down) [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	C	0.0 to 100.0 %/second (0.0: OFF) Setting will be invalid in ON/OFF control.	0.0
Display scale high [H-TIO-H/J, H-CIO-A, H-SIO-A]	R/W	C	Span 10000 or less [b] (Within −9999 to +10000)	H-TIO-H/J, H-CIO-A: 100.0 H-SIO-A: 300
Display scale low [H-TIO-H/J, H-CIO-A, H-SIO-A]	R/W	C	Span 10000 or less [b] (Within −9999 to +10000)	H-TIO-H/J, H-CIO-A: 0.0 H-SIO-A: 0
Digital filter [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	C	H-TIO-A/B/C/D/K/P 0 to 100 seconds (0: OFF) H-TIO-E/F/G/H/J/R, H-CIO-A, H-SIO-A 0.0 to 100.0 seconds (0.0: OFF)	0 or 0.0

[a] Heat control (H-TIO-☐/H-CIO-A): 0.0 Heat/cool control (H-TIO-☐/H-CIO-A): 100.0
Position proportioning control (H-TIO-K): 0.0 Speed control (H-SIO-A): 0

[b] The position of the decimal point differs depending on Decimal point position (P. 135) setting.

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Name	Attri-bute	Struc-ture	Data range	Factory set value
H-SIO-A control range [H-SIO-A]	R/W	C	0.00 to 50.00 %	10.00
H-SIO-A input frequency at full scale [H-SIO-A]	R/W	C	10 to 50000 Hz	130
H-SIO-A output scale high [H-SIO-A]	R/W	C	H-SIO-A output scale low to 10000 *	400
H-SIO-A output scale low [H-SIO-A]	R/W	C	–9999 to H-SIO-A output scale high *	0
H-SIO-A correction trigger [H-SIO-A]	R/W	C	0: Normal (Not executed) 1: Correction executed 2: Correction canceled Processing time of correction execution or cancel is about 1 second. Do not turn OFF the power during the processing time. In addition, maintain the setting more than 0.5 second in order to let it recognize modification in setting modification.	0
H-SIO-A correction actual measured value [H-SIO-A]	R/W	C	Within display scale range *	0
H-SIO-A measuring method [H-SIO-A]	R/W	C	0: Periodic computation method 1: Pulse count method	0
H-SIO-A divide ratio [H-SIO-A]	R/W	C	1 to 1000 Effective only for periodic computation method.	10
H-SIO-A gate time [H-SIO-A]	R/W	C	0.1 to 4.0 seconds Effective only for pulse count method.	1.0
H-SIO-A auto zero time [H-SIO-A]	R/W	C	1 to 100 seconds	5
H-SIO-A open/closed loop control transfer [H-SIO-A]	R/W	C	0: Closed loop control (PID control) 1: Open loop control	0
H-SIO-A alarm hold cancel time [H-SIO-A]	R/W	U	1 to 255 seconds Setting will be invalid in no alarm hold action.	60

* The position of the decimal point differs depending on Decimal point position (P. 135) setting.

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Name	Attribute	Structure	Data range	Factory set value
Decimal point position [H-TIO-H/J, H-CIO-A, H-SIO-A]	R/W	C	0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places	H-TIO-H/J, H-CIO-A: 1 H-SIO-A: 0
Input range number [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	C	H-TIO-A/B/C/D/K/P: 0 to 63 H-TIO-E/F/G/R, H-CIO-A: 0 to 120 H-TIO-H/J, H-CIO-A: 0 to 12 H-SIO-A: 0 (Fixed) If the input range number is changed, all of the settings corresponding to the channels in the relevant module return to the default values. See **Input range table (P. 107)**	The factory set value varies depending on the specifications when ordering.
Setting limiter (high) [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	C	TC/RTD input: Setting limiter (low) to Input range (high)	Input range (high)
		C	Current/voltage input, H-SIO-A: Setting limiter (low) to Display scale high	Display scale high
Setting limiter (low) [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	C	TC/RTD input: Input range (low) to Setting limiter (high)	Input range (low)
		C	Current/voltage input, H-SIO-A: Display scale low to Setting limiter (high)	Display scale low
Input error determination point (high) [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	C	TC/RTD input: Within input range	Input range (high)
		C	Current/voltage input, H-SIO-A: Within display scale range	Display scale high
Input error determination point (low) [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	C	TC/RTD input: Within input range	Input range (low)
		C	Current/voltage input, H-SIO-A: Within display scale range	Display scale low
Action at input error (high) [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	C	0: Normal control 1: Manipulated output value at input error	0 *
Action at input error (low) [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	C	0: Normal control 1: Manipulated output value at input error	0

* Heat control (H-TIO-☐/H-CIO-A): 0
  Heat/cool control (H-TIO-☐/H-CIO-A): 1
  Position proportioning control (H-TIO-K): 0
  Speed control (H-SIO-A): 0

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Name	Attri-bute	Struc-ture	Data range	Factory set value
AT bias [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	C	Within ± input span range	0 *
ON/OFF control differential gap (upper) [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	C	0.00 to 10.00 % of span	0.02
ON/OFF control differential gap (lower) [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	C	0.00 to 10.00 % of span	0.02
Manipulated output value at input error [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	C	−5.0 to +105.0 % (Heat control, Position proportioning control, Speed control) −105.0 to +105.0 % (Heat/cool control)	0.0
Direct/Reverse action selection [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	C	0: Direct action 1: Reverse action If the Direct/Reverse action selection is changed, all of the settings corresponding to the channels in the relevant module return to the default values. Setting will be invalid in heat/cool control.	The factory set value varies depending on the specifications when ordering.
Hot/Cold start selection [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	C	0: Hot start At restarting Operation mode → Same as mode before the power failure Output value → Same as value before the power failure 1: Cold start At restarting Operation mode → Same as mode before the power failure Output value → Output limiter (low)	1

* The position of the decimal point differs depending on the input range.

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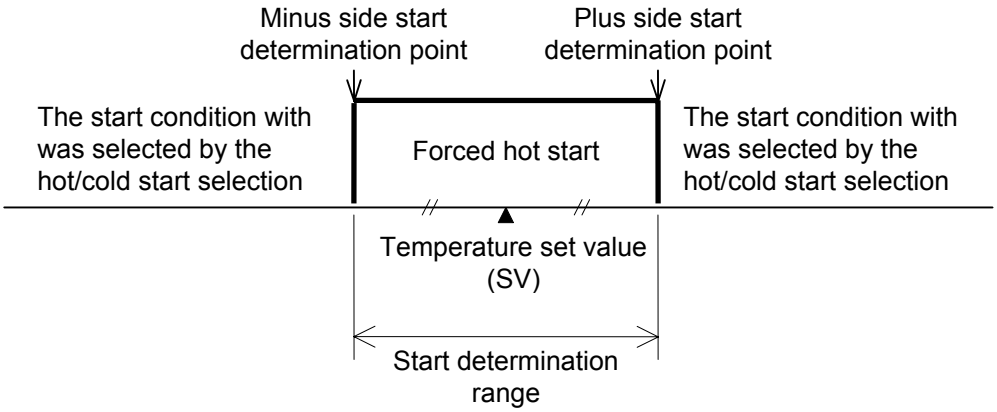
Name	Attri-bute	Struc-ture	Data range	Factory set value
Start determination point [1] [H-TIO-□, H-CIO-A]	R/W	C	0.0 to 100.0 % of span (Deviation setting from the temperature set value) Setting will be invalid in H-SIO-A module.	3.0
Control RUN/STOP holding [2] [H-PCP-J]	R/W	U	0: Not hold Start-up from control stop status 1: Hold Start-up from before the stop status 2: Start-up from control run status	1

[1] On restarting after power failure, if the temperature measured value (PV) is within the setting range by the start determination points, the hot start will definitely be carried out. If the temperature measured value (PV) is outside this range, the operation will begin with the start condition with was selected by the hot/cold start selection (Identifier XN).


Minus side start determination point
Plus side start determination point
The start condition with was selected by the hot/cold start selection
Forced hot start
The start condition with was selected by the hot/cold start selection
Temperature set value (SV)
Start determination range

[2] Action after power-ON differs depending on control RUN/STOP holding (Identifier X1) setting.

Control RUN/STOP holding	Status after power-ON	
	Operation mode transfer (See P. 129)	Control RUN/STOP transfer (See P. 131)
0: Not hold	Same as mode before the power failure	"0: Control STOP" Stopped until "1: Control RUN" is instructed from the PLC or host computer.
1: Hold	Same as mode before the power failure	Same as status before the power failure Control before power failure is maintained even if no PLC or host computer is connected.
2: Start-up from control run status	"1: Monitor" mode However if the operation mode is set to "0: Unused," "0: Unused" remains unchanged.	"1: Control RUN" However, no control is performed until the operation mode is set to "3: Normal (perform control)."

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Name	Attri-bute	Struc-ture	Data range	Factory set value
Temperature rise completion hold function [H-PCP-J]	R/W	U	0: Not hold 1: Hold	1
Interval time setting COM.PORT1/ COM.PORT2 [H-PCP-J]	R/W	U	0 to 100 ms	1
Interval time setting COM.PORT3 [H-PCP-J]	R/W	U	0 to 100 ms	1
PLC scanning time setting * [H-PCP-J]	R/W	U	0 to 3000 ms	10
Power supply frequency selection [H-PCP-J]	R/W	U	0: 50 Hz 1: 60 Hz	0
H-PCP-J module DO de-energized selection [H-PCP-J]	R/W	U	The respective channel status is assigned to each bit in the holding register. bit 0: DO1 bit 1: DO2 bit 2: DO3 bit 3: DO4 bit 4: DO5 bit 5: DO6 bit 6: DO7 bit 7: DO8 bit 8 to 15: Unused Bit data 0: Energized 1: De-energized [Decimal number: 0 to 255]	0
Number of HBA trigger points [H-CT-A]	R/W	U	0 to 255 times	5

* Set the PLC scanning time (time of waiting for a response from the PLC) so as to adapt to the environment used.

Setting example: Set PLC scanning time to any value more than twice as long as the maximum scanning time of PLC.

If PLC scanning time is extremely short (When at a factory set value of 10 ms as an example), the SR Mini HG SYSTEM may detect the time-out not conducting normal communication processing.
The maximum scanning time of PLC differs depending on the CPU processing speed, I/O unit configuration and the user program capacity of the PLC.

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Name	Attri-bute	Struc-ture	Data range	Factory set value
PV bias unit selection [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	U	0: % (of span) 1: Unit of input range	0 *
Integral time limiter at AT end [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	U	1 to 3600 seconds Setting will be valid in heat/cool control.	3600
Alarm 1 differential gap [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	U	0.00 to 10.00 % of span	0.10
Alarm 2 differential gap [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	U	0.00 to 10.00 % of span	0.10
Alarm 1 type selection [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	U	0: Process high alarm 1: Process low alarm 2: Deviation high alarm 3: Deviation low alarm 4: Deviation high/low alarm 5: Band alarm 6: No alarm function	The factory set value varies depending on the specifications when ordering.
Alarm 2 type selection [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	U		
Alarm 1 hold action [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	U	0: Not provided 1: Provided 2: Re-hold action Re-hold action will be valid in deviation alarm.	The factory set value varies depending on the specifications when ordering.
Alarm 2 hold action [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	U		
Alarm 1 interlock [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	U	0: Not provided 1: Provided	0
Alarm 2 interlock [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	U	0: Not provided 1: Provided	0
Alarm 1 action at input error [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	U	0: Normal alarm action 1: Forced alarm ON when temperature measured value exceeds abnormal input trigger input.	0
Alarm 2 action at input error [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	U	0: Normal alarm action 1: Forced alarm ON when temperature measured value exceeds abnormal input trigger input.	0

* For the ZK-1103 specification, the factory set value is 1 (Unit of input range).

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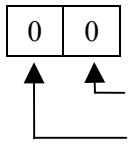
Name	Attri-bute	Struc-ture	Data range	Factory set value
Number of alarm delay times [H-TIO-□, H-CIO-A, H-SIO-A]	R/W	U	0 to 255 times	0
DO function selection [H-DO-A/B/D]	R/W	M	00 to 88 *	The factory set value varies depending on the specifications when ordering.
DI function selection [H-DI-A]	R/W	M	0: Unused 1: Function mode 1 – Memory area transfer (ENABLE terminal is used) After area selection setting, the actual area is changed by detecting the ENABLE edge. – Control RUN/STOP transfer – Alarm interlock release 2: Function mode 2 – Memory area transfer The actual area is changed approximately 2 seconds after area selection setting. – Control RUN/STOP transfer – Alarm interlock release	1

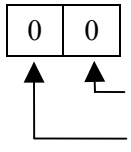
* DO function selection (H-DO-A/B/D module)

H-DO-A/B module



Setting will be valid for only block 1 (DO1 to DO4) in case of H-DO-B module.

H-DO-D module



Data range
- 0: No alarm function
- 1: Alarm 1
- 2: Alarm 2
- 3: Burnout
- 4: Heater break alarm (HBA)
- 5: AI alarm 1
- 6: AI alarm 2
- 7: Control loop break alarm (LBA)
- 8: (Not settable)

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Name	Attri-bute	Struc-ture	Data range	Factory set value
DI using selection [H-DI-A]	R/W	M	0 to 255 *	255
H-PCP-J module DO type selection [H-PCP-J]	R/W	C	0: No alarm function 1: Alarm 1/TI alarm 1 2: Alarm 2/TI alarm 2 3: Burnout 4: Heater break alarm (HBA) 5: Temperature rise completion output 6: AI alarm 1 7: AI alarm 2 8: Control loop break alarm (LBA) 9: FAIL output 10: PLC communication status [Action] 1 to 4, 6 to 8: Closed at alarm occurrence 5: Closed at temperature rise completion 9: Open at fail occurrence 10: Closed at communication with PLC Be action of energized case. Action reverses in case of de-energized. (For the energize/de-energized, see H-PCP-J module DO de-energized selection.)	CH1: 9 CH2: 1 CH3: 2 CH4: 3 CH5: 4 CH6: 5 CH7: 8 CH8: 10

* DI using selection (H-DI-A module)　　×: Used　　–: Unused

Setting data	Memory area transfer	Control RUN/STOP transfer	Alarm interlock release
63	×	×	×
127			
191			
255			
48	–	×	×
47	×	–	×
32	–	–	×
31	×	×	–
16	–	×	–
15	×	–	–
0	–	–	–

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Name	Attri-bute	Struc-ture	Data range	Factory set value
Cascade tracking [H-CIO-A]	R/W	M	0: Not provided Cascade monitored value becomes zero. 1: Provided Cascade monitored value just before is hold.	0
Cascade data selection [H-CIO-A]	R/W	M	0: Manipulated outpur value 1: Temperature measured value (PV) 2: Temperature set value (SV) 3: Set value monitor 4: Temperature deviation	0
Cascade DI function selection [H-CIO-A]	R/W	M	0: Unused 1: Cascade control ON/OFF only 2: Auto/Manual transfer only 3: DI1 valid (Cascade control ON/OFF), DI2 valid (Auto/Manual transfer)	3
DI process selection * [H-SIO-A]	R/W	M	0: Unused 1: H-SIO-A open/closed loop control transfer only 2: Control RUN/STOP transfer only 3: H-SIO-A open/closed loop control transfer and Control RUN/STOP transfer	3

* DI process selection setting or communication setting ×: Valid –: Invalid

Transfer by external contact input	Transfer via communication	
DI process selection	H-SIO-A open/closed loop control transfer (See P. 134)	Control RUN/STOP transfer (See P. 131)
0: Unused	×	×
1: H-SIO-A open/closed loop control transfer only	–	×
2: Control RUN/STOP transfer only	×	–
3: H-SIO-A open/closed loop control transfer and Control RUN/STOP transfer	–	–

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Name	Attri-bute	Struc-ture	Data range	Factory set value
Positioning adjustment counter [H-TIO-K]	R/W	C	0 to 100 *	0
H-CT-A module heater break alarm status [H-CT-A]	RO	C	0: Normal 1: Break 2: Welding	—
H-DI-A module input status [H-DI-A]	RO	M	The respective channel status is assigned to each bit in the holding register. bit 0: CH1 (DI1) bit 1: CH2 (DI2) bit 2: CH3 (DI3) bit 3: CH4 (DI4) bit 4: CH5 (DI5) bit 5: CH6 (DI6) bit 6: CH7 (DI7) bit 7: CH8 (DI8) bit 8 to 15: Unused Bit data 0: OFF 1: ON [Decimal number: 0 to 255]	—
Cascade monitor [H-CIO-A]	RO	C	± Input span Data will be valid in slave channel	—
Positioning monitor [H-TIO-K]	RO	C	−5.0 to +105.0 %	—

* Positioning adjustment counter
The opening adjustment and the motor time are taken in. When the specified setting counter value is input, the operations begin. (This is only valid when control is stopped.)

📖 **Always adjust the opening first and capture the motor time after the adjustment is complete.**

Motor time (See P. 132) → FBR opening adjustment → Capture the motor time → Setting to normal status

☞ For details, see the ■ **Positioning adjustment counter (P. 106)**.

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Name	Attri-bute	Struc-ture	Data range	Factory set value
H-DO-G manipulated output value [H-DO-G]	RO	C	–5.0 to +105.0 %	–
H-DO-G output limiter (high) [H-DO-G]	R/W	C	Output limiter (low) to 105.0 %	100.0
H-DO-G output limiter (low) [H-DO-G]	R/W	C	–5.0 % to Output limiter (high)	0.0
H-DO-G output cycle time [H-DO-G]	R/W	C	1 to 100 seconds	2
H-DO-G master channel setting [H-DO-G]	R/W	C	0 to The number of H-TIO-□ module use channel (0: Unused)	0
H-DO-G output ratio set value [H-DO-G]	R/W	C	0.001 to 9.999	1.00
H-DO-G Auto/Manual transfer [H-DO-G]	R/W	C	0: Auto 1: Manual Setting will be invalid in ON/OFF control and heat/cool control.	0
H-DO-G manual output value [H-DO-G]	R/W	C	–5.0 to +105.0 % Setting will be invalid in ON/OFF control and heat/cool control.	0.0

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Name	Attri-bute	Struc-ture	Data range	Factory set value
AI measured value [H-AI-A/B]	RO	C	Within display scale range *	—
AI status [H-AI-A/B]	RO	C	The respective channel status is assigned to each bit in the holding register. bit 0: AI alarm 1 status bit 1: AI alarm 2 status bit 2 to 15: Unused Bit data 0: OFF 1: ON [Decimal number: 0 to 3]	—
AI alarm 1 set value [H-AI-A/B]	R/W	C	Within display scale range *	Process high alarm: 100.0 Process low alarm: 0.0 No alarm function: 100.0
AI alarm 2 set value [H-AI-A/B]	R/W	C	Within display scale range *	Process high alarm: 100.0 Process low alarm: 0.0 No alarm function: 0.0
AI zero point correction [H-AI-A/B]	R/W	C	0: Cancel 1: Execution	0
AI full scale correction [H-AI-A/B]	R/W	C	0: Cancel 1: Execution	0
AI operation mode transfer [H-AI-A/B]	R/W	C	0: Unused mode Neither monitor nor alarm monitor is done in this mode. 1: Normal mode Normal mode in which monitor and alarm are done.	1

* The position of the decimal point differs depending on AI decimal point position (P. 146) setting.

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Name	Attri-bute	Struc-ture	Data range	Factory set value
AI input range number [H-AI-A/B]	R/W	C	0: 0 to 10 mV DC 1: −10 to +10 mV DC 2: 0 to 100 mV DC 3: −100 to +100 mV DC 4: 0 to 1 V DC 5: −1 to +1 V DC 6: 0 to 5 V DC 7: 1 to 5 V DC 8: −5 to +5 V DC 9: 0 to 10 V DC 10: −10 to +10 V DC 11: 0 to 20 mA DC 12: 4 to 20 mA DC Voltage (low) input group: 0 to 8 Voltage (high) input group: 9 to 10 Current input group: 11 to 12 An input type change may only be made within the input groups. If the input range number is changed, all of the settings corresponding to the channels in the relevant module return to the default values.	The factory set value varies depending on the specifications when ordering.
AI display scale high [H-AI-A/B]	R/W	C	Span 10000 or less (Within −9999 to +10000) *	100.0
AI display scale low [H-AI-A/B]	R/W	C	Span 10000 or less (Within −9999 to +10000) *	0.0
AI decimal point position [H-AI-A/B]	R/W	C	0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places	1
AI digital filter [H-AI-A/B]	R/W	C	0.0 to 100.0 seconds (0.0: OFF)	0.0
AI moving average [H-AI-A/B]	R/W	C	0: Not provided 1: Provided	0
AI alarm 1 differential gap [H-AI-A/B]	R/W	U	0.00 to 10.00 % of span	0.10
AI alarm 2 differential gap [H-AI-A/B]	R/W	U	0.00 to 10.00 % of span	0.10

* The position of the decimal point differs depending on AI decimal point position (P. 146) setting.

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Name	Attri-bute	Struc-ture	Data range	Factory set value
AI alarm 1 type selection [H-AI-A/B]	R/W	U	0: Process high alarm 1: Process low alarm 2 to 6: No alarm function	The factory set value varies depending on the specifications when ordering.
AI alarm 2 type selection [H-AI-A/B]	R/W	U	0: Process high alarm 1: Process low alarm 2 to 6: No alarm function	The factory set value varies depending on the specifications when ordering.
AI alarm 1 hold action [H-AI-A/B]	R/W	U	0: Not provided 1: Provided	The factory set value varies depending on the specifications when ordering.
AI alarm 2 hold action [H-AI-A/B]	R/W	U	0: Not provided 1: Provided	The factory set value varies depending on the specifications when ordering.
AI alarm 1 interlock [H-AI-A/B]	R/W	U	0: Not provided 1: Provided	0
AI alarm 2 interlock [H-AI-A/B]	R/W	U	0: Not provided 1: Provided	0
Number of AI alarm delay times [H-AI-A/B]	R/W	U	0 to 255 times	0

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Name	Attri-bute	Struc-ture	Data range	Factory set value
TI measured value [H-TI-A/B/C]	RO	C	Within input range	—
TI status [H-TI-A/B/C]	RO	C	The respective channel status is assigned to each bit in the holding register. bit 0: TI alarm 1 status bit 1: TI alarm 2 status bit 2: TI Burnout status bit 3 to 15: Unused Bit data 0: OFF 1: ON [Decimal number: 0 to 7]	—
TI alarm 1 set value [H-TI-A/B/C]	R/W	C	Within input range	The factory set value varies depending on the alarm type. *
TI alarm 2 set value [H-TI-A/B/C]	R/W	C	Within input range	The factory set value varies depending on the alarm type. *
TI PV bias [H-TI-A/B/C]	R/W	C	−5.00 to +5.00 % of span	0.00
TI operation mode transfer [H-TI-A/B/C]	R/W	C	0: Unused mode Neither monitor nor alarm monitor is done in this mode. 1: Normal mode Normal mode in which monitor and alarm are done.	1
TI input range number [H-TI-A/B/C]	R/W	C	0 to 120 If the input range number is changed, all of the settings corresponding to the channels in the relevant module return to the default values. See **Input range table (P. 107)**	The factory set value varies depending on the specifications when ordering.
TI digital filter [H-TI-A/B/C]	R/W	C	0.0 to 100.0 seconds (0.0: OFF)	0.0

* Process high alarm: Input range (high)
  Process low alarm: Input range (low)
  No alarm function: Input range (high) for TI alarm 1 set value or
  Input range (low) for TI alarm 2 set value
  The position of the decimal point differs depending on the input range.

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Name	Attri-bute	Struc-ture	Data range	Factory set value
TI alarm 1 differential gap [H-TI-A/B/C]	R/W	U	0.00 to 10.00 % of span	0.10
TI alarm 2 differential gap [H-TI-A/B/C]	R/W	U		
TI alarm 1 type selection [H-TI-A/B/C]	R/W	U	0: Process high alarm 1: Process low alarm 2 to 6: No alarm function	The factory set value varies depending on the specifications when ordering.
TI alarm 2 type selection [H-TI-A/B/C]	R/W	U		
TI alarm 1 hold action [H-TI-A/B/C]	R/W	U	0: Not provided 1: Provided	The factory set value varies depending on the specifications when ordering.
TI alarm 2 hold action [H-TI-A/B/C]	R/W	U		
TI alarm 1 interlock [H-TI-A/B/C]	R/W	U	0: Not provided 1: Provided	0
TI alarm 2 interlock [H-TI-A/B/C]	R/W	U		
TI alarm 1 action at input error [H-TI-A/B/C]	R/W	U	0: Normal alarm action 1: Forced alarm ON when temperature measured value exceeds abnormal input trigger input.	0
TI alarm 2 action at input error [H-TI-A/B/C]	R/W	U		
Number of TI alarm delay times [H-TI-A/B/C]	R/W	U	0 to 255 times	0

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Name	Attri-bute	Struc-ture	Data range	Factory set value
AO output value monitor [H-AO-A/B]	RO	C	Display scale range * Data will be valid in manual mode.	—
AO output set value [H-AO-A/B]	R/W	C	Display scale range * Setting will be valid in manual mode.	0.0
AO function selection [H-AO-A/B]	R/W	C	0: Unused 1: Manual mode (outputs data given by the AO output set value) 2: Temperature measured value (PV) 3: Set value monitor 4: Temperature deviation value (deviation between the temperature measured value and set value monitor) 5: Heat-side manipulated output value 6: Cool-side manipulated output value 7: AI measured value 8: TI measured value 9: Opening monitor (2 to 9: Recorder output mode)	1
AO corresponding channel setting [H-AO-A/B]	R/W	C	1 to 20 (TIO channel) 1 to 40 (AI and TI channel) Setting will be valid in recorder output mode.	1
AO zooming high limit [H-AO-A/B]	R/W	C	AO zooming low limit to 100.0 % Setting will be valid in recorder output mode.	100.0
AO zooming low limit [H-AO-A/B]	R/W	C	0.0 % to AO zooming high limit Setting will be valid in recorder output mode.	0.0
AO zero point correction [H-AO-A/B]	R/W	C	−5.00 to +5.00 %	0.00
AO full scale correction [H-AO-A/B]	R/W	C	−5.00 to +5.00 %	0.00
AO display scale high [H-AO-A/B]	R/W	C	Span 10000 or less * (Within −9999 to +10000)	100.0
AO display scale low [H-AO-A/B]	R/W	C	Span 10000 or less * (Within −9999 to +10000)	0.0
AO decimal point position [H-AO-A/B]	R/W	C	0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places	1
AO output change rate limiter [H-AO-A/B]	R/W	C	0.0 to 100.0 %/second (0.0: OFF)	0.0

* The position of the decimal point differs depending on AO decimal point position (P. 150) setting.

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Name	Attri-bute	Struc-ture	Data range	Factory set value
Event DI contact input monitor [H-DI-B]	RO	M	The respective channel status is assigned to each bit in the holding register. bit 0: CH1 (DI1) bit 1: CH2 (DI2) bit 2: CH3 (DI3) bit 3: CH4 (DI4) bit 4: CH5 (DI5) bit 5: CH6 (DI6) bit 6: CH7 (DI7) bit 7: CH8 (DI8) bit 8 to 15: Unused Bit data 0: OFF 1: ON [Decimal number: 0 to 255]	—
Event DI logic output monitor [H-DI-B]	RO	M	The respective channel status is assigned to each bit in the holding register. bit 0: Logic output 1 bit 1: Logic output 2 bit 2: Logic output 3 bit 3: Logic output 4 bit 4: Logic output 5 bit 5: Logic output 6 bit 6: Logic output 7 bit 7: Logic output 8 bit 8 to 15: Unused Bit data 0: OFF 1: ON [Decimal number: 0 to 255]	—
Event DI logic input monitor [H-DI-B]	RO	L	The respective channel status is assigned to each bit in the holding register. bit 0: Logic input 1 bit 1: Logic input 2 bit 2: Logic input 3 bit 3: Logic input 4 bit 4 to 15: Unused Bit data 0: OFF 1: ON [Decimal number: 0 to 15]	—

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Name	Attri-bute	Struc-ture	Data range	Factory set value
Event DI type selection 1 [H-DI-B]	R/W	L	0 to 30 * (17 to 30: Not settable)	0
Event DI type selection 2 [H-DI-B]	R/W	L	0 to 30 * (17 to 30: Not settable)	0
Event DI type selection 3 [H-DI-B]	R/W	L	0 to 30 * (17 to 30: Not settable)	0
Event DI type selection 4 [H-DI-B]	R/W	L	0 to 30 * (17 to 30: Not settable)	0
Event DI corresponding channel selection 1 [H-DI-B]	R/W	L	1 to 80 *	1
Event DI corresponding channel selection 2 [H-DI-B]	R/W	L	1 to 80 *	1
Event DI corresponding channel selection 3 [H-DI-B]	R/W	L	1 to 80 *	1
Event DI corresponding channel selection 4 [H-DI-B]	R/W	L	1 to 80 *	1
Event DI reversal selection 1 [H-DI-B]	R/W	L	0: Normal 1: Reversal	0
Event DI reversal selection 2 [H-DI-B]	R/W	L	0: Normal 1: Reversal	0
Event DI reversal selection 3 [H-DI-B]	R/W	L	0: Normal 1: Reversal	0
Event DI reversal selection 4 [H-DI-B]	R/W	L	0: Normal 1: Reversal	0
Event DI logic circuit selection [H-DI-B]	R/W	L	0: *AND* (1 active) 1: *NAND* (0 active) 2: *OR* (1 active) 3: *NOR* (0 active)	0
Event DI delay timer setting [H-DI-B]	R/W	L	0 to 255 times	1

* Set the type and corresponding channel of Event DI. Event DI uses it with logic input function.
Each contact status can be monitored by the following data.

Digital input (1 to 8) → Event DI contact input monitor (See P. 151)
Logic input (1 to 4)/Logic section → Event DI logic input monitor (See P. 151)
Logic input (1 to 8) → Event DI logic output monitor (See P. 151)

☞ For the data , see the ■ **Logic input function (P. 104)**.

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Name	Attri-bute	Struc-ture	Data range	Factory set value
Event DO status [H-DO-C]	RO	M	The respective channel status is assigned to each bit in the holding register. bit 0: CH1 (DO 1) bit 1: CH2 (DO 2) bit 2: CH3 (DO 3) bit 3: CH4 (DO 4) bit 4: CH5 (DO 5) bit 5: CH6 (DO 6) bit 6: CH7 (DO 7) bit 7: CH8 (DO 8) bit 8 to 15: Unused Bit data 0: OFF 1: ON [Decimal number: 0 to 255]	—
Event DO manual output value [H-DO-C]	R/W	M		0
Event DO extension alarm set value [H-DO-C]	R/W	C	TC/RTD input: Within input range or span range Current/voltage input, H-SIO-A: Within display scale range or span range	0 [a]
Event DO function selection [H-DO-C]	R/W	C	0 to 30 [b]	0
Event DO corresponding channel setting [H-DO-C]	R/W	C	1 to 40 [b]	1
Event DO mode select setting [H-DO-C]	R/W	C	0 to 40 [b]	0
Event DO extension alarm differential gap [H-DO-C]	R/W	U	0.00 to 10.00 %	0.10
Event DO extension alarm interlock [H-DO-C]	R/W	U	0: Not provided 1: Provided	0
Number of Event DO extension alarm delay times [H-DO-C]	R/W	U	0 to 255 times	0

[a] The position of the decimal point differs depending on the input range.

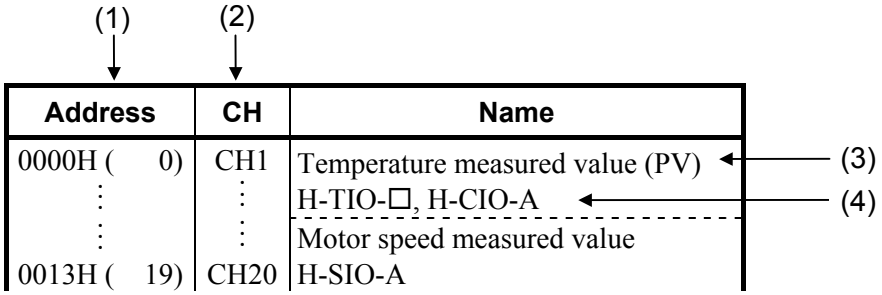
[b] Set the function, corresponding channel and mode select of Event DO. Event DO uses it with event output function.

☞ For the data, see the ■ **Event output function (P. 101)**.

7.4 Data Map

7.4.1 Reference to data map

This data map summarizes the data addresses, channels and names that can be used with Modbus protocol. For details on each data range, see **7.3.3 Communication data list (P. 124)**.



(1) Address: Address of data is written with hexadecimal number.
Characters in ( ) are decimal number.

Addresses in holding registers used for the Modbus protocol start with 0, but generally those for the PLC, SCADA and display panel start with 40001.
Therefore if the holding register is specified by the PLC, SCADA and display panel, 1 is added to the address (in a decimal number) described in the data map and also 4 is affixed to the 5th digit * of the same address.

* Differs depending on the Model and driver used.

Example:

Data map address		**PLC address**
For 0000H (0)	➔	40001
For 0064H (100)	➔	40101

(2) CH: Channel number every data is written.

(3) Name: Data names is written

(4) Correspondence module:
The functional module name that data becomes valid is written.

Data of following address with H-TIO-☐/H-CIO-A module is different from H-SIO-A module. Data is discriminated by channel number (module number).

Address	For H-TIO-☐/H-CIO-A module	For H-SIO-A module
0000H (0) to 0013H (19)	Temperature measured value (PV) CH1 to CH20	Motor speed measured value CH1 to CH20
00C8H (200) to 00DBH (219)	Temperature set value (SV) CH1 to CH20	Motor speed set value CH1 to CH20
0744H (1860) to 074DH (1869)	Cascade DI function selection Module 1 to Module 10	DI process selection Module 1 to Module 10

For the channel number, see the **8.2.9 Assignment of channels (P. 183)**.

7.4.2 Data map list

(1) Read only data

Address	CH	Name
0000H (0) ⋮ 0013H (19)	CH1 ⋮ CH20	Temperature measured value (PV) H-TIO-☐, H-CIO-A Motor speed measured value H-SIO-A
0014H (20) ⋮ 0027H (39)	CH1 ⋮ CH20	Heat-side manipulated output value H-TIO-☐, H-CIO-A, H-SIO-A
0028H (40) ⋮ 003BH (59)	CH1 ⋮ CH20	Cool-side manipulated output value H-TIO-☐, H-CIO-A, H-SIO-A
003CH (60) ⋮ 004FH (79)	CH1 ⋮ CH20	Current transformer input measured value 1 H-TIO-A/C/D
0050H (80) ⋮ 0063H (99)	CH1 ⋮ CH20	Current transformer input measured value 2 H-CT-A
0064H (100) ⋮ 0077H (119)	CH1 ⋮ CH20	Status H-TIO-☐, H-CIO-A, H-SIO-A
0078H (120)	—	Temperature rise completion status (for each control unit) H-TIO-☐, H-CIO-A
0079H (121)	—	Error code (for each control unit) H-PCP-J
007AH (122)	—	Overall alarm status (for each control unit) H-PCP-J
007BH (123) ⋮ 008BH (139)	—	Do not use this address range
008CH (140) ⋮ 009FH (159)	CH1 ⋮ CH20	Set value monitor H-TIO-☐, H-CIO-A, H-SIO-A
00A0H (160) ⋮ 00C7H (199)	CH21 ⋮ CH60	Current transformer input measured value 2 H-CT-A

(2) Read/Write data

Address	CH	Name
00C8H (200) ⋮ 00DBH (219)	CH1 ⋮ CH20	Temperature set value (SV) H-TIO-☐, H-CIO-A Motor speed set value H-SIO-A
00DCH (220) ⋮ 00EFH (239)	CH1 ⋮ CH20	PID/AT transfer H-TIO-☐, H-CIO-A, H-SIO-A
00F0H (240) ⋮ 0103H (259)	CH1 ⋮ CH20	Heat-side proportional band H-TIO-☐, H-CIO-A, H-SIO-A
0104H (260) ⋮ 0117H (279)	CH1 ⋮ CH20	Cool-side proportional band H-TIO-☐, H-CIO-A
0118H (280) ⋮ 012BH (299)	CH1 ⋮ CH20	Integral time H-TIO-☐, H-CIO-A, H-SIO-A
012CH (300) ⋮ 013FH (319)	CH1 ⋮ CH20	Derivative time H-TIO-☐, H-CIO-A, H-SIO-A
0140H (320) ⋮ 0153H (339)	CH1 ⋮ CH20	Overlap/deadband H-TIO-☐, H-CIO-A
0154H (340) ⋮ 0167H (359)	CH1 ⋮ CH20	Control response parameters H-TIO-☐, H-CIO-A, H-SIO-A
0168H (360) ⋮ 017BH (379)	CH1 ⋮ CH20	Alarm 1 set value H-TIO-☐, H-CIO-A, H-SIO-A
017CH (380) ⋮ 018FH (399)	CH1 ⋮ CH20	Alarm 2 set value H-TIO-☐, H-CIO-A, H-SIO-A
0190H (400) ⋮ 01A3H (419)	CH1 ⋮ CH20	Heater break alarm set value 1 H-TIO-A/C/D
01A4H (420) ⋮ 01B7H (439)	CH1 ⋮ CH20	Heater break alarm set value 2 H-CT-A
01B8H (440) ⋮ 01CBH (459)	CH1 ⋮ CH20	Operation mode transfer H-TIO-☐, H-CIO-A, H-SIO-A

Address	CH	Name
01CCH (460) ⋮ 01DFH (479)	CH1 ⋮ CH20	Heat-side proportioning cycle time H-TIO-☐, H-CIO-A
01E0H (480) ⋮ 01F3H (499)	CH1 ⋮ CH20	Cool-side proportioning cycle time H-TIO-☐, H-CIO-A
01F4H (500) ⋮ 0207H (519)	CH1 ⋮ CH20	Auto/Manual transfer H-TIO-☐, H-CIO-A
0208H (520) ⋮ 021BH (539)	CH1 ⋮ CH20	Manual output value H-TIO-☐, H-CIO-A
021CH (540) ⋮ 022FH (559)	CH1 ⋮ CH20	LBA use selection H-TIO-☐, H-CIO-A
0230H (560) ⋮ 0243H (579)	CH1 ⋮ CH20	LBA time H-TIO-☐, H-CIO-A
0244H (580) ⋮ 0257H (599)	CH1 ⋮ CH20	LBA deadband H-TIO-☐, H-CIO-A
0258H (600) ⋮ 026BH (619)	CH1 ⋮ CH20	PV bias H-TIO-☐, H-CIO-A, H-SIO-A
026CH (620) ⋮ 027FH (639)	CH1 ⋮ CH20	Temperature rise completion range H-TIO-☐, H-CIO-A
0280H (640) ⋮ 0293H (659)	CH1 ⋮ CH20	Temperature rise completion trigger H-TIO-☐, H-CIO-A
0294H (660) ⋮ 02A7H (679)	CH1 ⋮ CH20	CT channel setting H-CT-A
02A8H (680) ⋮ 02BBH (699)	—	Do not use this address range
02BCH (700)	—	Control RUN/STOP transfer (for each control unit) H-PCP-J

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Address	CH	Name
02BDH (701)	—	Memory area number (for each control unit) H-TIO-☐, H-CIO-A, H-SIO-A
02BEH (702)	—	Temperature rise completion soak time (for each control unit) H-TIO-☐, H-CIO-A
02BFH (703)	—	Module initialization (for each control unit) H-PCP-J
02C0H (704)	—	Alarm interlock release (for each control unit) H-PCP-J
02C1H (705) ⋮ 02CFH (719)	—	Do not use this address range
02D0H (720) ⋮ 02F7H (759)	CH21 ⋮ CH60	CT channel setting H-CT-A
02F8H (760) ⋮ 030BH (779)	CH1 ⋮ CH20	Cascade ON/OFF H-CIO-A
030CH (780) ⋮ 031FH (799)	CH1 ⋮ CH20	Cascade gain H-CIO-A
0320H (800) ⋮ 0333H (819)	CH1 ⋮ CH20	Cascade bias H-CIO-A
0334H (820) ⋮ 0347H (839)	CH1 ⋮ CH20	Positioning output neutral zone H-TIO-K
0348H (840) ⋮ 035BH (859)	CH1 ⋮ CH20	Motor time H-TIO-K
035CH (860) ⋮ 036FH (879)	CH1 ⋮ CH20	Integrated output limiter H-TIO-K
0370H (880) ⋮ 0383H (899)	CH1 ⋮ CH20	Manual positioning output value H-TIO-K
0384H (900) ⋮ 03ABH (939)	CH21 ⋮ CH60	Heater break alarm set value 2 H-CT-A
03ACH (940) ⋮ 03E7H (999)	—	Do not use this address range

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(3) Read/Write data (initial data)

Address	CH	Name
03E8H (1000) ⋮ 03FBH (1019)	CH1 ⋮ CH20	Setting change rate limiter H-TIO-☐, H-CIO-A, H-SIO-A
03FCH (1020) ⋮ 040FH (1039)	CH1 ⋮ CH20	Output limiter (high) H-TIO-☐, H-CIO-A, H-SIO-A
0410H (1040) ⋮ 0423H (1059)	CH1 ⋮ CH20	Output limiter (low) H-TIO-☐, H-CIO-A, H-SIO-A
0424H (1060) ⋮ 0437H (1079)	CH1 ⋮ CH20	Output change rate limiter (up) H-TIO-☐, H-CIO-A, H-SIO-A
0438H (1080) ⋮ 044BH (1099)	CH1 ⋮ CH20	Output change rate limiter (down) H-TIO-☐, H-CIO-A, H-SIO-A
044CH (1100) ⋮ 045FH (1119)	CH1 ⋮ CH20	Display scale high H-TIO-H/J, H-CIO-A, H-SIO-A
0460H (1120) ⋮ 0473H (1139)	CH1 ⋮ CH20	Display scale low H-TIO-H/J, H-CIO-A, H-SIO-A
0474H (1140) ⋮ 0487H (1159)	CH1 ⋮ CH20	Digital filter H-TIO-☐, H-CIO-A, H-SIO-A
0488H (1160) ⋮ 049BH (1179)	CH1 ⋮ CH20	H-SIO-A control range H-SIO-A
049CH (1180) ⋮ 04AFH (1199)	CH1 ⋮ CH20	H-SIO-A input frequency at full scale H-SIO-A
04B0H (1200) ⋮ 04C3H (1219)	CH1 ⋮ CH20	H-SIO-A output scale high H-SIO-A
04C4H (1220) ⋮ 04D7H (1239)	CH1 ⋮ CH20	H-SIO-A output scale low H-SIO-A
04D8H (1240) ⋮ 04EBH (1259)	CH1 ⋮ CH20	H-SIO-A correction trigger H-SIO-A
04ECH (1260) ⋮ 04FFH (1279)	CH1 ⋮ CH20	H-SIO-A correction actual measured value H-SIO-A
0500H (1280) ⋮ 0513H (1299)	CH1 ⋮ CH20	H-SIO-A measuring method H-SIO-A
0514H (1300) ⋮ 0527H (1319)	CH1 ⋮ CH20	H-SIO-A divide ratio H-SIO-A
0528H (1320) ⋮ 053BH (1339)	CH1 ⋮ CH20	H-SIO-A gate time H-SIO-A
053CH (1340) ⋮ 054FH (1359)	CH1 ⋮ CH20	H-SIO-A auto zero time H-SIO-A
0550H (1360) ⋮ 0563H (1379)	CH1 ⋮ CH20	H-SIO-A open/closed loop control transfer H-SIO-A
0564H (1380)	—	H-SIO-A alarm hold cancel time (for each control unit) H-SIO-A
0565H (1381) ⋮ 0577H (1399)	—	Do not use this address range
0578H (1400) ⋮ 058BH (1419)	CH1 ⋮ CH20	Decimal point position H-TIO-H/J, H-CIO-A, H-SIO-A
058CH (1420) ⋮ 059FH (1439)	CH1 ⋮ CH20	Input range number H-TIO-☐, H-CIO-A, H-SIO-A
05A0H (1440) ⋮ 05B3H (1459)	CH1 ⋮ CH20	Setting limiter (high) H-TIO-☐, H-CIO-A, H-SIO-A
05B4H (1460) ⋮ 05C7H (1479)	CH1 ⋮ CH20	Setting limiter (low) H-TIO-☐, H-CIO-A, H-SIO-A
05C8H (1480) ⋮ 05DBH (1499)	CH1 ⋮ CH20	Input error determination point (high) H-TIO-☐, H-CIO-A, H-SIO-A

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Address	CH	Name
05DCH (1500) ⋮ 05EFH (1519)	CH1 ⋮ CH20	Input error determination point (low) H-TIO-☐, H-CIO-A, H-SIO-A
05f0H (1520) ⋮ 0603H (1539)	CH1 ⋮ CH20	Action at input error (high) H-TIO-☐, H-CIO-A, H-SIO-A
0604H (1540) ⋮ 0617H (1559)	CH1 ⋮ CH20	Action at input error (low) H-TIO-☐, H-CIO-A, H-SIO-A
0618H (1560) ⋮ 062BH (1579)	CH1 ⋮ CH20	AT bias H-TIO-☐, H-CIO-A, H-SIO-A
062CH (1580) ⋮ 063FH (1599)	CH1 ⋮ CH20	ON/OFF control differential gap (upper) H-TIO-☐, H-CIO-A, H-SIO-A
0640H (1600) ⋮ 0653H (1619)	CH1 ⋮ CH20	ON/OFF control differential gap (lower) H-TIO-☐, H-CIO-A, H-SIO-A
0654H (1620) ⋮ 0667H (1639)	CH1 ⋮ CH20	Manipulated output value at input error H-TIO-☐, H-CIO-A, H-SIO-A
0668H (1640) ⋮ 067BH (1659)	CH1 ⋮ CH20	Direct/Reverse action selection H-TIO-☐, H-CIO-A, H-SIO-A
067CH (1660) ⋮ 068FH (1679)	CH1 ⋮ CH20	Hot/Cold start selection H-TIO-☐, H-CIO-A, H-SIO-A
0690H (1680) ⋮ 06A3H (1699)	CH1 ⋮ CH20	Start determination point H-TIO-☐, H-CIO-A
06A4H (1700)	—	Control RUN/STOP holding (for each control unit) H-PCP-J
06A5H (1701)	—	Temperature rise completion hold function (for each control unit) H-PCP-J
06A6H (1702)	—	Interval time setting COM.PORT1/COM.PORT2 (for each control unit) H-PCP-J
06A7H (1703)	—	Interval time setting COM.PORT3 (for each control unit) H-PCP-J
06A8H (1704)	—	PLC scanning time setting (for each control unit) H-PCP-J
06A9H (1705)	—	Power supply frequency selection (for each control unit) H-PCP-J
06AAH (1706)	—	H-PCP-J module DO de-energized selection (for each control unit) H-PCP-J
06ABH (1707)	—	Number of HBA trigger points (for each control unit) H-CT-A
06ACH (1708)	—	PV bias unit selection (for each control unit) H-TIO-☐, H-CIO-A, H-SIO-A
06ADH (1709)	—	Integral time limiter at AT end (for each control unit) H-TIO-☐, H-CIO-A, H-SIO-A
06AEH (1710) ⋮ 06B7H (1719)	—	Do not use this address range
06B8H (1720)	—	Alarm 1 differential gap (for each control unit) H-TIO-☐, H-CIO-A, H-SIO-A
06B9H (1721)	—	Alarm 2 differential gap (for each control unit) H-TIO-☐, H-CIO-A, H-SIO-A
06BAH (1722)	—	Alarm 1 type selection (for each control unit) H-TIO-☐, H-CIO-A, H-SIO-A
06BBH (1723)	—	Alarm 2 type selection (for each control unit) H-TIO-☐, H-CIO-A, H-SIO-A
06BCH (1724)	—	Alarm 1 hold action (for each control unit) H-TIO-☐, H-CIO-A, H-SIO-A

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Address	CH	Name
06BDH (1725)	—	Alarm 2 hold action (for each control unit) H-TIO-☐, H-CIO-A, H-SIO-A
06BEH (1726)	—	Alarm 1 interlock (for each control unit) H-TIO-☐, H-CIO-A, H-SIO-A
06BFH (1727)	—	Alarm 2 interlock (for each control unit) H-TIO-☐, H-CIO-A, H-SIO-A
06C0H (1728)	—	Alarm 1 action at input error (for each control unit) H-TIO-☐, H-CIO-A, H-SIO-A
06C1H (1729)	—	Alarm 2 action at input error (for each control unit) H-TIO-☐, H-CIO-A, H-SIO-A
06C2H (1730)	—	Number of alarm delay times (for each control unit) H-TIO-☐, H-CIO-A, H-SIO-A
06C3H (1731) ⋮ 06CBH (1739)	—	Do not use this address range
06CCH (1740) ⋮ 06D5H (1749)	—	DO function selection (for each module) H-DO-A/B/D
06D6H (1750) ⋮ 06DFH (1759)	—	Do not use this address range
06E0H (1760) ⋮ 06E9H (1769)	—	DI function selection (for each module data) H-DI-A
06EAH (1770) ⋮ 06F3H (1779)	—	Do not use this address range
06F4H (1780) ⋮ 06FDH (1789)	—	DI using selection (for each module data) H-DI-A
06FEH (1790) ⋮ 0707H (1799)	—	Do not use this address range
0708H (1800) ⋮ 070FH (1807)	CH1 ⋮ CH8	H-PCP-J module DO type selection H-PCP-J
0710H (1808) ⋮ 071BH (1819)	—	Do not use this address range
071CH (1820) ⋮ 0725H (1829)	—	Cascade tracking (for each module) H-CIO-A
0726H (1830) ⋮ 072FH (1839)	—	Do not use this address range
0730H (1840) ⋮ 0739H (1849)	—	Cascade data selection (for each module) H-CIO-A
073AH (1850) ⋮ 0743H (1859)	—	Do not use this address range
0744H (1860) ⋮ 074DH (1869)	—	Cascade DI function selection (for each module) H-CIO-A DI process selection (for each module) H-SIO-A
074EH (1870) ⋮ 0757H (1879)	—	Do not use this address range
0758H (1880) ⋮ 076BH (1899)	CH1 ⋮ CH8	Positioning adjustment counter H-TIO-K
076CH (1900) ⋮ 085BH (2139)	—	Do not use this address range

Continued on the next page.

(4) Read only data

Address	CH	Name
085CH (2140) ⋮ 0897H (2199)	CH1 ⋮ CH60	H-CT-A module heater break alarm status H-CT-A
0898H (2200) ⋮ 08A1H (2209)	—	H-DI-A module input status (for each module) H-DI-A
08A2H (2210) ⋮ 08ABH (2219)	—	Do not use this address range
08ACH (2220) ⋮ 08BFH (2239)	CH1 ⋮ CH20	Cascade monitor H-CIO-A
08C0H (2240) ⋮ 08D3H (2259)	CH1 ⋮ CH20	Positioning monitor H-TIO-K
08D4H (2260) ⋮ 0BB7H (2999)	—	Do not use this address range

(5) H-DO-G module data

Address	CH	Name
0BB8H (3000) ⋮ 0C57H (3159)	CH1 ⋮ CH160	H-DO-G manipulated output value H-DO-G
0C58H (3160) ⋮ 0CF7H (3319)	CH1 ⋮ CH160	H-DO-G output limiter (high) H-DO-G
0CF8H (3320) ⋮ 0D97H (3479)	CH1 ⋮ CH160	H-DO-G output limiter (low) H-DO-G
0D98H (3480) ⋮ 0E37H (3639)	CH1 ⋮ CH160	H-DO-G output cycle time H-DO-G
0E38H (3640) ⋮ 0ED7H (3799)	CH1 ⋮ CH160	H-DO-G master channel setting H-DO-G
0ED8H (3800) ⋮ 0F77H (3959)	CH1 ⋮ CH160	H-DO-G output ratio set value H-DO-G
0F78H (3960) ⋮ 1017H (4119)	CH1 ⋮ CH160	H-DO-G Auto/Manual transfer H-DO-G
1018H (4120) ⋮ 10B7H (4279)	CH1 ⋮ CH160	H-DO-G manual output value H-DO-G
10B8H (4280) ⋮ 1193H (4499)	—	Do not use this address range

(6) H-AI-A/B module data

Address	CH	Name
1194H (4500) ⋮ 11BBH (4539)	CH1 ⋮ CH40	AI measured value H-AI-A/B
11BCH (4540) ⋮ 11E3H (4579)	CH1 ⋮ CH40	AI status H-AI-A/B
11E4H (4580) ⋮ 120BH (4619)	CH1 ⋮ CH40	AI alarm 1 set value H-AI-A/B
120CH (4620) ⋮ 1233H (4659)	CH1 ⋮ CH40	AI alarm 2 set value H-AI-A/B
1234H (4660) ⋮ 125BH (4699)	CH1 ⋮ CH40	AI zero point correction H-AI-A/B
125CH (4700) ⋮ 1283H (4739)	CH1 ⋮ CH40	AI full scale correction H-AI-A/B
1284H (4740) ⋮ 12ABH (4779)	CH1 ⋮ CH40	AI operation mode transfer H-AI-A/B
12ACH (4780) ⋮ 12D3H (4819)	CH1 ⋮ CH40	AI input range number H-AI-A/B
12D4H (4820) ⋮ 12FBH (4859)	CH1 ⋮ CH40	AI display scale high H-AI-A/B
12FCH (4860) ⋮ 1323H (4899)	CH1 ⋮ CH40	AI display scale low H-AI-A/B
1324H (4900) ⋮ 134BH (4939)	CH1 ⋮ CH40	AI decimal point position H-AI-A/B
134CH (4940) ⋮ 1373H (4979)	CH1 ⋮ CH40	AI digital filter H-AI-A/B
1374H (4980) ⋮ 139BH (5019)	CH1 ⋮ CH40	AI moving average H-AI-A/B

Address	CH	Name
139CH (5020)	—	AI alarm 1 differential gap (for each control unit) H-AI-A/B
139DH (5021)	—	AI alarm 2 differential gap (for each control unit) H-AI-A/B
139EH (5022)	—	AI alarm 1 type selection (for each control unit) H-AI-A/B
139FH (5023)	—	AI alarm 2 type selection (for each control unit) H-AI-A/B
13A0H (5024)	—	AI alarm 1 hold action (for each control unit) H-AI-A/B
13A1H (5025)	—	AI alarm 2 hold action (for each control unit) H-AI-A/B
13A2H (5026)	—	AI alarm 1 interlock (for each control unit) H-AI-A/B
13A3H (5027)	—	AI alarm 2 interlock (for each control unit) H-AI-A/B
13A4H (5028)	—	Number of AI alarm delay times (for each control unit) H-AI-A/B
13A5H (5029) ⋮ 13EBH (5099)	—	Do not use this address range

(7) H-TI-A/B/C module data

Address	CH	Name
13ecH (5100) ⋮ 1413H (5139)	CH1 ⋮ CH40	TI measured value H-TI-A/B/C
1414H (5140) ⋮ 143BH (5179)	CH1 ⋮ CH40	TI status H-TI-A/B/C
143CH (5180) ⋮ 1463H (5219)	CH1 ⋮ CH40	TI alarm 1 set value H-TI-A/B/C
1464H (5220) ⋮ 148BH (5259)	CH1 ⋮ CH40	TI alarm 2 set value H-TI-A/B/C
148CH (5260) ⋮ 14B3H (5299)	CH1 ⋮ CH40	TI PV bias H-TI-A/B/C
14B4H (5300) ⋮ 14DBH (5339)	CH1 ⋮ CH40	TI operation mode transfer H-TI-A/B/C
14DCH (5340) ⋮ 1503H (5379)	CH1 ⋮ CH40	TI input range number H-TI-A/B/C
1504H (5380) ⋮ 152BH (5419)	CH1 ⋮ CH40	TI digital filter H-TI-A/B/C
152CH (5420)	—	TI alarm 1 differential gap (for each control unit) H-TI-A/B/C
152DH (5421)	—	TI alarm 2 differential gap (for each control unit) H-TI-A/B/C
152EH (5422)	—	TI alarm 1 type selection (for each control unit) H-TI-A/B/C
152FH (5423)	—	TI alarm 2 type selection (for each control unit) H-TI-A/B/C
1530H (5424)	—	TI alarm 1 hold action (for each control unit) H-TI-A/B/C
1531H (5425)	—	TI alarm 2 hold action (for each control unit) H-TI-A/B/C
1532H (5426)	—	TI alarm 1 interlock (for each control unit) H-TI-A/B/C
1533H (5427)	—	TI alarm 2 interlock (for each control unit) H-TI-A/B/C
1534H (5428)	—	TI alarm 1 action at input error (for each control unit) H-TI-A/B/C
1535H (5429)	—	TI alarm 2 action at input error (for each control unit) H-TI-A/B/C
1536H (5430)	—	Number of TI alarm delay times (for each control unit) H-TI-A/B/C
1537H (5431) ⋮ 157bH (5499)	—	Do not use this address range

(8) H-AO-A/B module data

Address	CH	Name
157CH (5500) ⋮ 15A3H (5539)	CH1 ⋮ CH160	AO output value monitor H-AO-A/B
15A4H (5540) ⋮ 15CBH (5579)	CH1 ⋮ CH160	AO output set value H-AO-A/B
15CCH (5580) ⋮ 15F3H (5619)	CH1 ⋮ CH160	AO function selection H-AO-A/B
15F4H (5620) ⋮ 161BH (5659)	CH1 ⋮ CH160	AO corresponding channel setting H-AO-A/B
161CH (5660) ⋮ 1643H (5699)	CH1 ⋮ CH160	AO zooming high limit H-AO-A/B
1644H (5700) ⋮ 166BH (5739)	CH1 ⋮ CH160	AO zooming low limit H-AO-A/B
166CH (5740) ⋮ 1693H (5779)	CH1 ⋮ CH160	AO zero point correction H-AO-A/B
1694H (5780) ⋮ 16BBH (5819)	CH1 ⋮ CH160	AO full scale correction H-AO-A/B
16BCH (5820) ⋮ 16E3H (5859)	CH1 ⋮ CH160	AO display scale high H-AO-A/B
16E4H (5860) ⋮ 170BH (5899)	CH1 ⋮ CH160	AO display scale low H-AO-A/B
170CH (5900) ⋮ 1733H (5939)	CH1 ⋮ CH160	AO decimal point position H-AO-A/B
1734H (5940) ⋮ 175BH (5979)	CH1 ⋮ CH160	AO output change rate limiter H-AO-A/B
175CH (5980) ⋮ 176FH (5999)	—	Do not use this address range

(9) H-DI-B module data (Event DI data)

Address	CH	Name
1770H (6000) ⋮ ⋮ 1779H (6009)	—	Event DI contact input monitor (for each module) H-DI-B
177AH (6010) ⋮ 1783H (6019)	—	Do not use this address range
1784H (6020) ⋮ 178DH (6029)	—	Event DI logic output monitor (for each module) H-DI-B
178EH (6030) ⋮ 1797H (6039)	—	Do not use this address range
1798H (6040) ⋮ 17E7H (6119)	—	Event DI logic input monitor (for each event input logic circuit) H-DI-B
17E8H (6120) ⋮ 1837H (6199)	—	Event DI type selection 1 (for each event input logic circuit) H-DI-B
1838H (6200) ⋮ 1887H (6279)	—	Event DI type selection 2 (for each event input logic circuit) H-DI-B
1888H (6280) ⋮ 18D7H (6359)	—	Event DI type selection 3 (for each event input logic circuit) H-DI-B
18D8H (6360) ⋮ 1927H (6439)	—	Event DI type selection 4 (for each event input logic circuit) H-DI-B
1928H (6440) ⋮ ⋮ 1977H (6519)	—	Event DI corresponding channel selection 1 (for each event input logic circuit) H-DI-B
1978H (6520) ⋮ ⋮ 19C7H (6599)	—	Event DI corresponding channel selection 2 (for each event input logic circuit) H-DI-B
19C8H (6600) ⋮ ⋮ 1A17H (6679)	—	Event DI corresponding channel selection 3 (for each event input logic circuit) H-DI-B
1A18H (6680) ⋮ ⋮ 1A67H (6759)	—	Event DI corresponding channel selection 4 (for each event input logic circuit) H-DI-B
1A68H (6760) ⋮ 1AB7H (6839)	—	Event DI reversal selection 1 (for each event input logic circuit) H-DI-B
1AB8H (6840) ⋮ 1B07H (6919)	—	Event DI reversal selection 2 (for each event input logic circuit) H-DI-B
1B08H (6920) ⋮ 1B57H (6999)	—	Event DI reversal selection 3 (for each event input logic circuit) H-DI-B
1B58H (7000) ⋮ 1BA7H (7079)	—	Event DI reversal selection 4 (for each event input logic circuit) H-DI-B
1BA8H (7080) ⋮ 1BF7H (7159)	—	Event DI logic circuit selection (for each event input logic circuit) H-DI-B
1BF8H (7160) ⋮ 1C47H (7239)	—	Event DI delay timer setting (for each event input logic circuit) H-DI-B
1C48H (7240) ⋮ 1C83H (7299)	—	Do not use this address range

(10) H-DO-C module data (Event DO data)

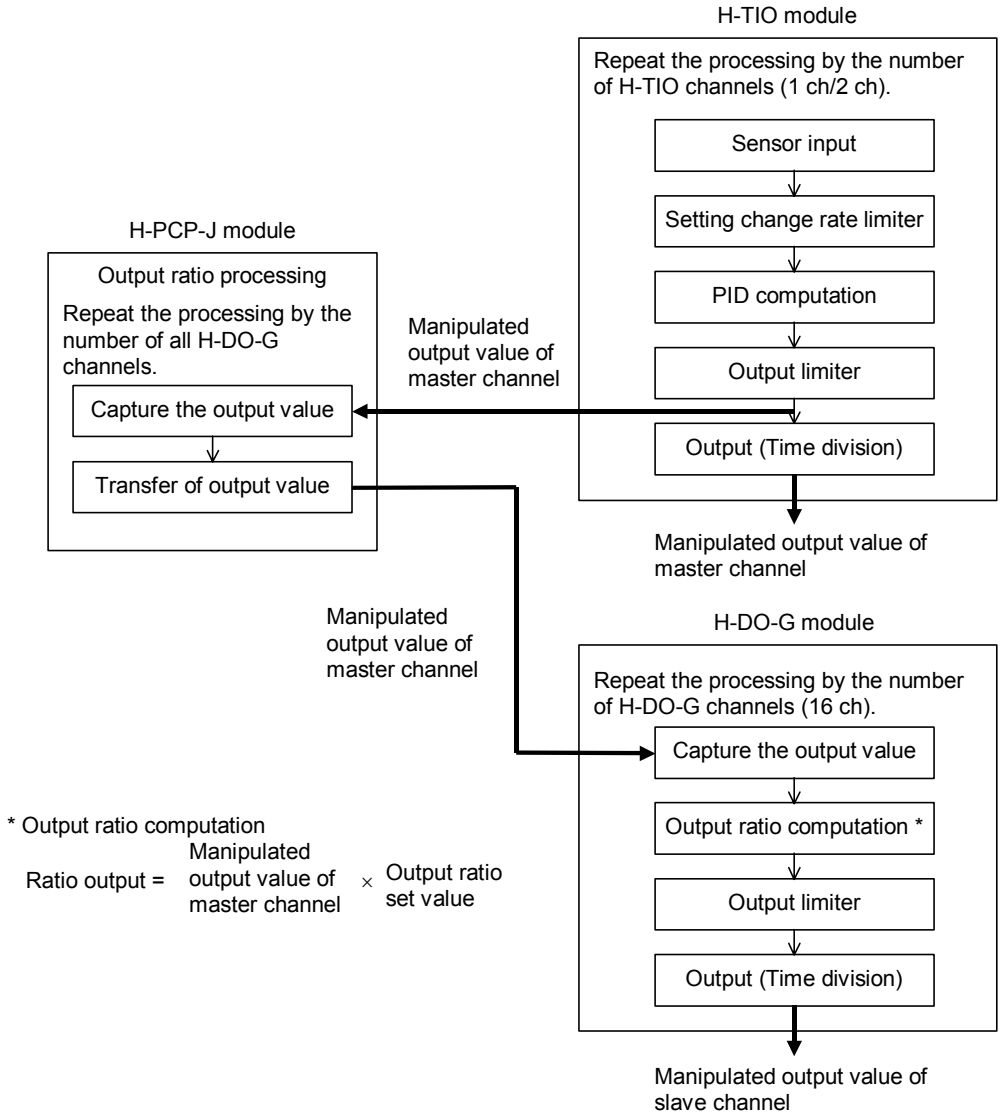
Address	CH	Name
1C84H (7300) ⋮ 1C8DH (7309)	—	Event DO status (for each module) H-DO-C
1C8EH (7310) ⋮ 1C97H (7319)	—	Do not use this address range
1C98H (7320) ⋮ 1CA1H (7329)	—	Event DO manual output value (for each module) H-DO-C
1CA2H (7330) ⋮ 1CABH (7339)	—	Do not use this address range
1CACH (7340) ⋮ 1CFBH (7419)	CH1 ⋮ CH160	Event DO extension alarm set value H-DO-C
1CFCH (7420) ⋮ 1D4BH (7499)	CH1 ⋮ CH160	Event DO function selection H-DO-C
1D4CH (7500) ⋮ 1D9BH (7579)	CH1 ⋮ CH160	Event DO corresponding channel setting H-DO-C
1D9CH (7580) ⋮ 1DEBH (7659)	CH1 ⋮ CH160	Event DO mode select setting H-DO-C
1DECH (7660)	—	Event DO extension alarm differential gap (for each control unit) H-DO-C
1DEDH (7661)	—	Event DO extension alarm interlock (for each control unit) H-DO-C
1DEEH (7662)	—	Number of Event DO extension alarm delay times (for each control unit) H-DO-C

8. FUNCTIONS

8.1 Output Ratio

Output ratio function multiplies value (gradient) set with output ratio in manipulated output value of master channel (Temperature control module H-TIO-□), and it is function to output the consequence as manipulated output value from slave channel (Digital output module H-DO-G).
Other than H-PCP-J module, H-TIO-□ module and H-DO-G module are requirement to do output ratio function.

■ Function block diagram

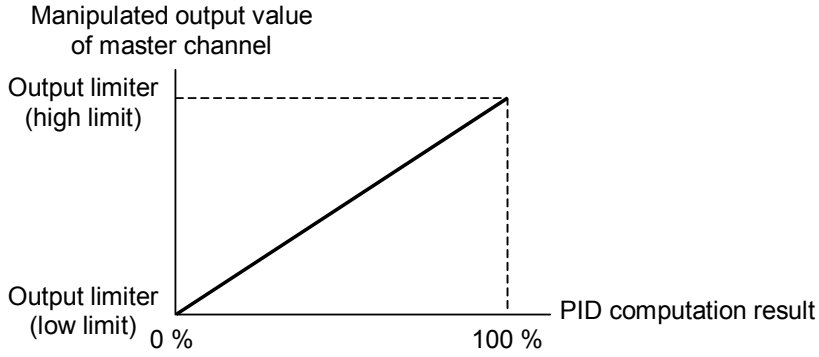

H-TIO module
Repeat the processing by the number of H-TIO channels (1 ch/2 ch).
Sensor input
Setting change rate limiter
PID computation
Output limiter
Output (Time division)
Manipulated output value of master channel
H-PCP-J module
Output ratio processing
Repeat the processing by the number of all H-DO-G channels.
Capture the output value
Transfer of output value
Manipulated output value of master channel
Manipulated output value of master channel
H-DO-G module
Repeat the processing by the number of H-DO-G channels (16 ch).
Capture the output value
Output ratio computation *
Output limiter
Output (Time division)
Manipulated output value of slave channel
* Output ratio computation
Ratio output = Manipulated output value of master channel × Output ratio set value

- 20 ms is more late with maximum than manipulated output value of master channel, and manipulated output value of slave channel is updated.
- When "Auto" was selected with Auto/Manual transfer of H-DO-G module, output ratio operation is done. When "Manual" was selected, value set in H-DO-G manual output value is output as manipulated output value of slave channel.
- The output ratio function correspond to RKC communication protocol and Modbus protocol.

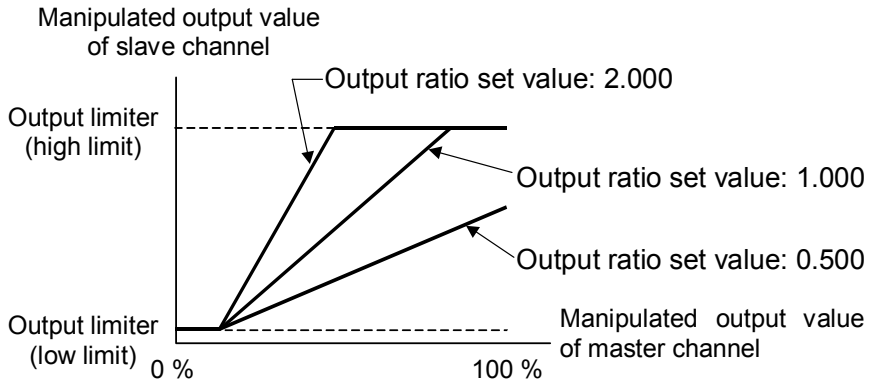
■ Output ratio action

Manipulated output value of master channel and slave channel are output within the output limiter range.

Master channel (H-TIO module)



Slave channel (H-DO-G module)



■ Assignment of the master channels

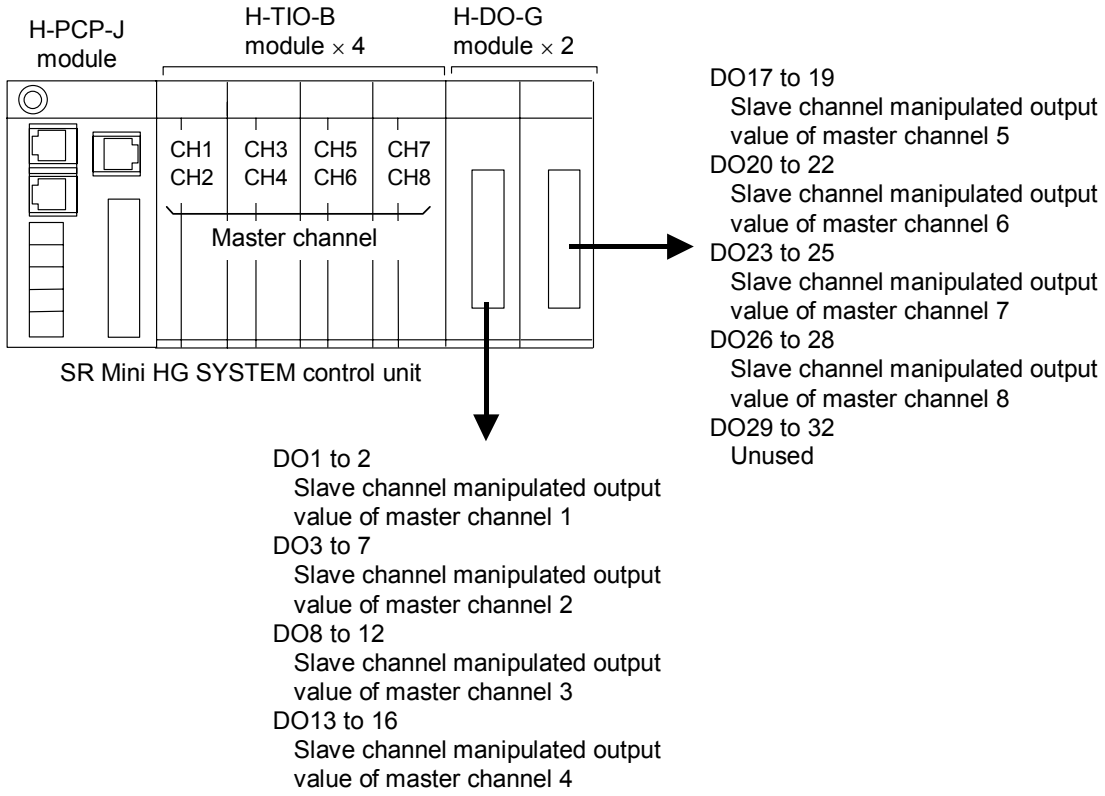
It is possible to assign the master channel corresponding to the slave channel if in the same unit.
The master channel is assigned by “H-DO-G master channel setting.”

H-DO-G master channel setting

Setting range: 0 to The number of H-TIO-□ module use channel (0: Unused)

Example: Setting in the following system configuration.

H-PCP-J module 1
H-TIO-B module (2 channels) ..... 4 (Master channel 1 to 8)
H-DO-G module (16 channels) ..... 2 (Slave channel 1 to 32)


H-PCP-J module
H-TIO-B module × 4
H-DO-G module × 2
CH1
CH2
CH3
CH4
CH5
CH6
CH7
CH8
Master channel
SR Mini HG SYSTEM control unit
DO17 to 19
Slave channel manipulated output value of master channel 5
DO20 to 22
Slave channel manipulated output value of master channel 6
DO23 to 25
Slave channel manipulated output value of master channel 7
DO26 to 28
Slave channel manipulated output value of master channel 8
DO29 to 32
Unused
DO1 to 2
Slave channel manipulated output value of master channel 1
DO3 to 7
Slave channel manipulated output value of master channel 2
DO8 to 12
Slave channel manipulated output value of master channel 3
DO13 to 16
Slave channel manipulated output value of master channel 4

Continued on the next page.

H-DO-G master channel setting example

Slave channel No. (H-DO-G module)	H-DO-G master channel setting
1	1
2	1
3	2
4	2
5	2
6	2
7	2
8	3
9	3
10	3
11	3
12	3
13	4
14	4
15	4
16	4

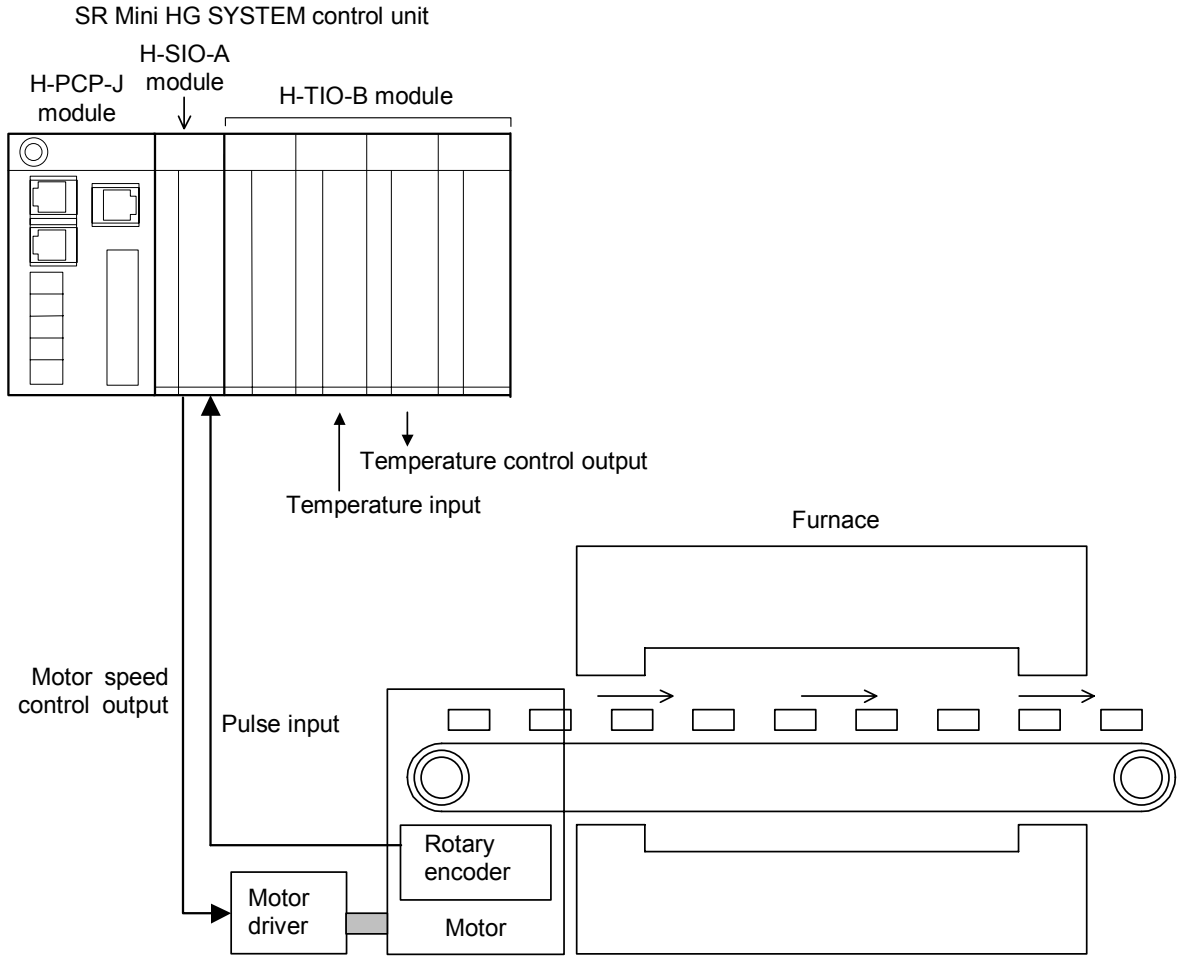
Slave channel No. (H-DO-G module)	H-DO-G master channel setting
17	5
18	5
19	5
20	6
21	6
22	6
23	7
24	7
25	7
26	8
27	8
28	8
29	0
30	0
31	0
32	0

☞ For the H-TIO-☐ module, see the **Hardware Instruction Manual (IMSRM15-E☐).**

☞ For the H-DO-G module, see the **H-DO-G Instruction Manual (IMS01K01-E☐)**.

8.2 Speed Control

Speed control function inputs pulse from rotary encoder, and motor speed is controlled.
Other than H-PCP-J module, H-SIO-A module are requirement to do speed control function.



Speed control

8.2.1 Display scale

This function scales the display range of the input value between –9999 to +10000. However, the maximum span is 10000.

H-SIO-A input frequency at full scale:

Sets the frequency of encoder when display scale high value (full scale) is displayed.

Setting rage: 10 to 50000 Hz

Display scale high:

Sets the high limit value (full scale) of display scale.

Setting rage: –9999 to +10000 (Span 10000 or less)

Display scale low:

Sets value to display when pulse input from encoder stopped.

Setting rage: –9999 to +10000 (Span 10000 or less)

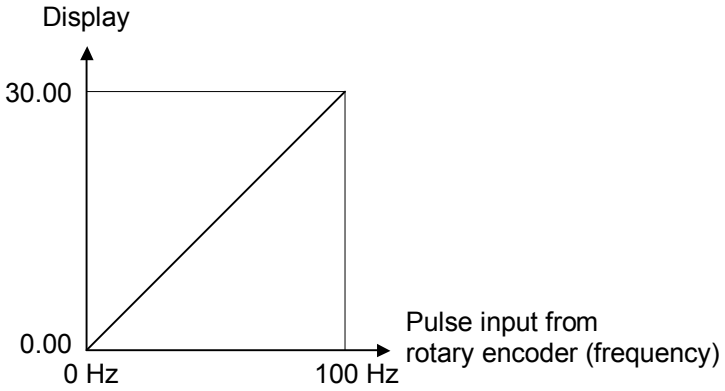
Decimal point position:

Sets the decimal point position of input display.

Setting rage: 0: No digit below decimal point 1: 1 digit below decimal point
2: 2 digits below decimal point 3: 3 digits below decimal point

Example: When set it in the following value

H-SIO-A input frequency at full scale: 100 Hz
Display scale high: 3000
Display scale low: 0
Decimal point position: 2 (2 digits below decimal point)



8.2.2 Measuring method

Can be selected periodic computation method or pulse count method.

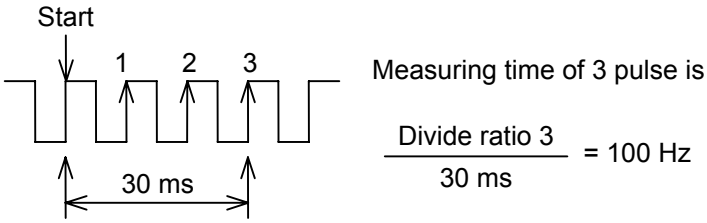
- **Periodic computation method**

Frequency is obtained by measuring the time required for certain pulse intervals. The number of measured pulses can be set in the pulse range of 1 to 1000 by setting divide ratio.

Setting range

H-SIO-A divide ratio: 1 to 1000

Example: When divide ratio is set to 3.



The input value is updated every 100 ms. It is also updated every 100 ms even at a measuring time of less than 100 ms.

If the number of pulses set by divide ratio cannot be detected within the H-SIO-A auto zero time, this is assumed to be pulse stop and thus the input value is set to the low limit value on the display scale.

Setting range

H-SIO-A auto zero time: 1 to 100 seconds

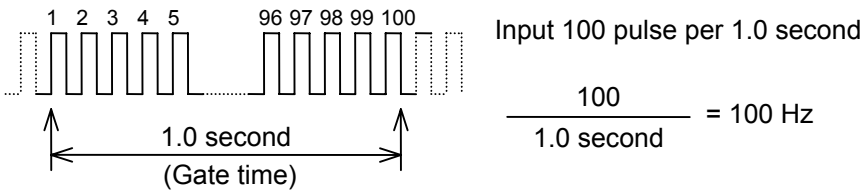
- **Pulse count method**

Frequency is obtained by counting the number of pulses input within the gate time.

Setting range

H-SIO-A gate time: 0.1 to 4.0 seconds

Example: When gate time is set to 1.0 second.



8.2.3 Output scale

This function scales the output range between –9999 to +10000.

H-SIO-A output scale high:

Sets the value equivalent to display scale of control output high limit.

Setting rage: H-SIO-A output scale low to 10000

H-SIO-A output scale low:

Sets the value equivalent to display scale of control output low limit.

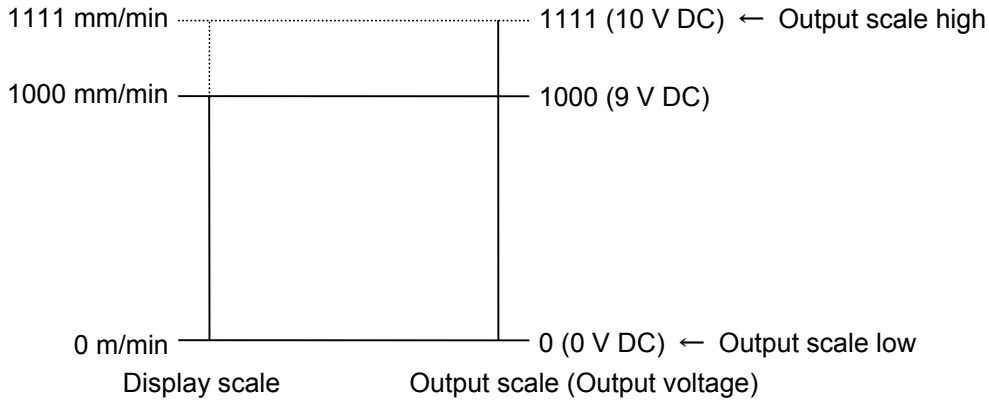
Setting rage: –9999 to H-SIO-A output scale high

Example: Output scale setting when the control output value is 9 V DC at maximum motor speed of 1000 mm/min.

Control output: Voltage output 0 to 10 V DC

Display scale high: 1000

Display scale low: 0


1111 mm/min
1111 (10 V DC) ← Output scale high
1000 mm/min
1000 (9 V DC)
0 m/min
0 (0 V DC) ← Output scale low
Display scale
Output scale (Output voltage)

$$\text{Output scale high} = \frac{\text{Display scale high (1000)}}{\text{Control output value at maximum motor speed (9 V DC)}} \times \text{Control output high limit (10 V DC)} = 1111$$

Set 1111 to output scale high, and set 0 to output scale low.

📖 In order to limit the maximum output voltage to 9 V DC, the control output is limited up to 90 % by setting the high limit of the output limiter to 90.0 %.

8.2.4 Output limiter

This function limits the output range of the control output.

Output limiter (high):

Sets the high limit value when control output is limited.

Setting rage: Output limiter (low) to 105.0 %

Output limiter (low):

Sets the low limit value when control output is limited.

Setting rage: –5.0 % to Output limiter (high)

8.2.5 Controls

This instrument controls with open loop control or PID control (closed loop control).

(1) Open loop control

In a deviation between the motor speed measured value and set value is larger than the H-SIO-A control range set value, or the H-SIO-A open/closed loop control transfer is "1: Open loop control," the instrument is in open loop control, thereby outputting a constant control output value corresponding to the motor speed set value.

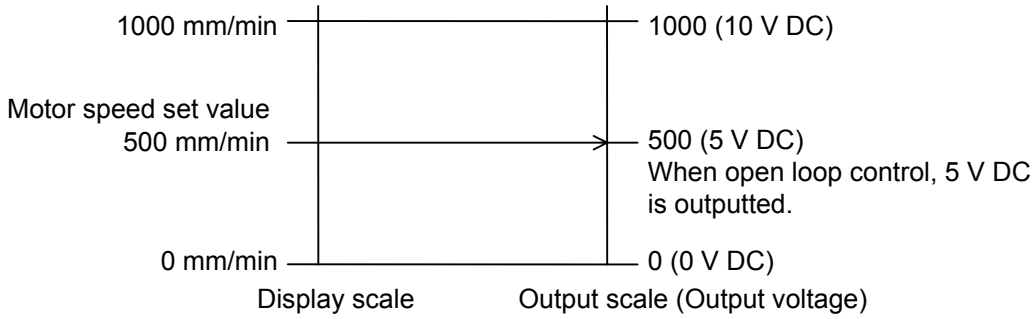
H-SIO-A control range:

The motor speed measured value to perform PID control (closed loop control) and the deviation from the motor speed set value are set.

Setting rage: 0.00 to 50.00 %

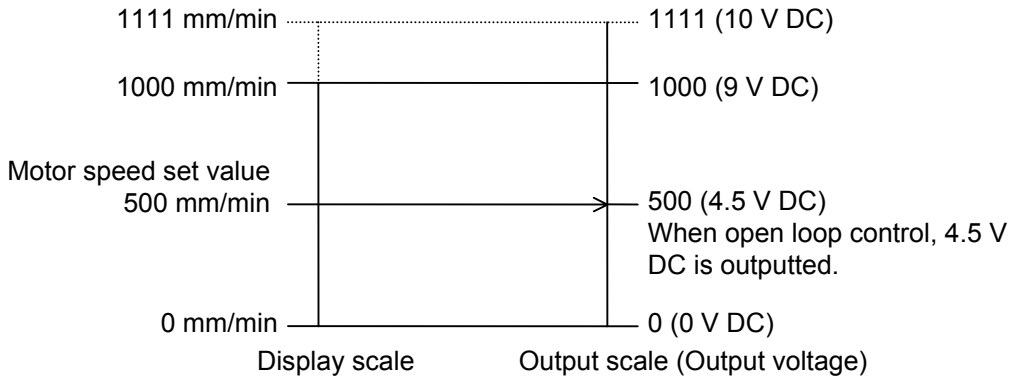
Example 1: When control output value is 10 V DC at maximum motor speed of 1000 mm/min.

Control output: Voltage output 0 to 10 V DC Output scale high: 1000
Display scale high: 1000 Output scale low: 0
Display scale low: 0



Example 2: When control output value is 9 V DC at maximum motor speed of 1000 mm/min

Control output: Voltage output 0 to 10 V DC Output scale high: 1111 *
Display scale high: 1000 Output scale low: 0
Display scale low: 0 Output limiter (high): 90.0 %
* Equivalent to display scale of 10 V DC



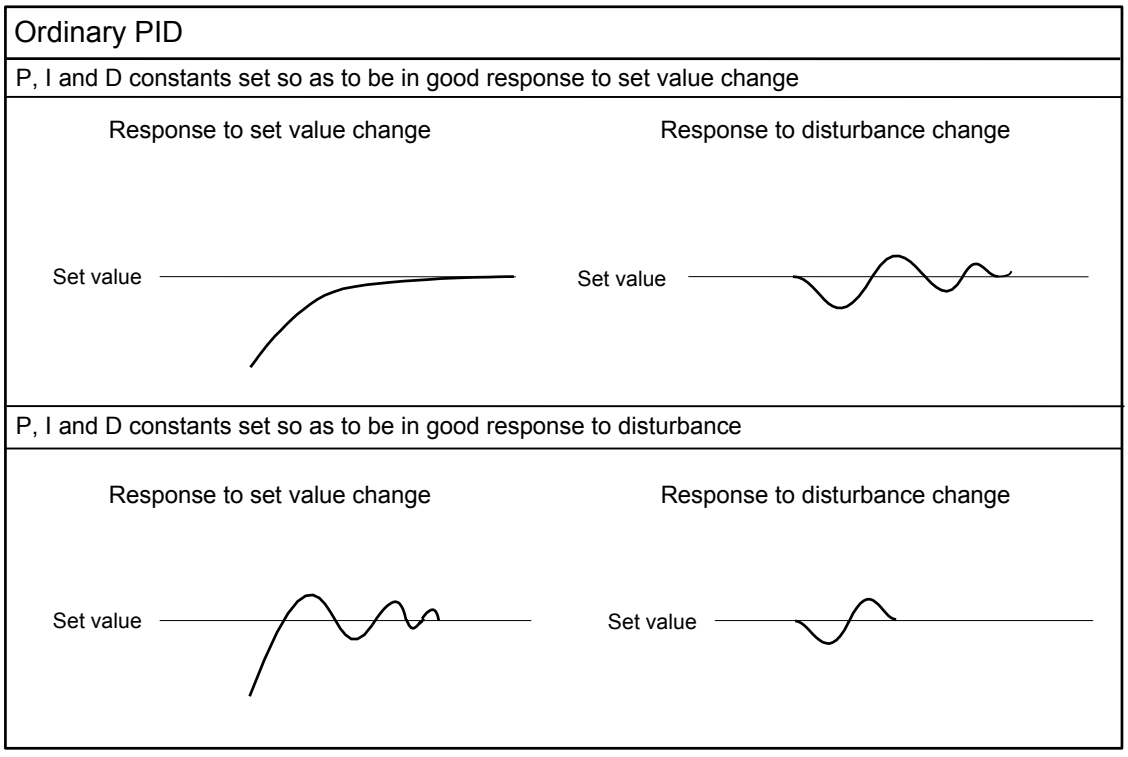
(2) PID Control (Closed loop control)

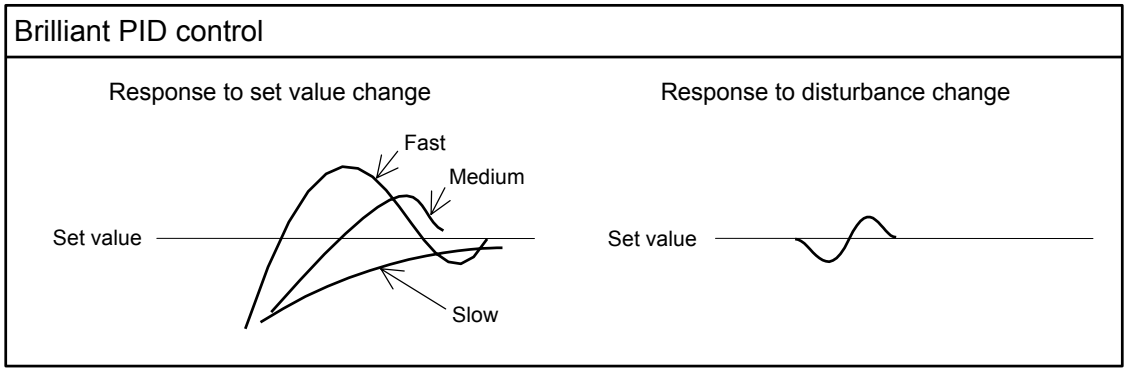
If a deviation between the motor speed measured value and set value is within the control range set value, and the H-SIO-A open/closed loop control transfer is "0: Closed loop control," the instrument performs PID control.

PI control (factory set value, derivative time: 0) is recommended in case of speed control.

■ Brilliant PID control

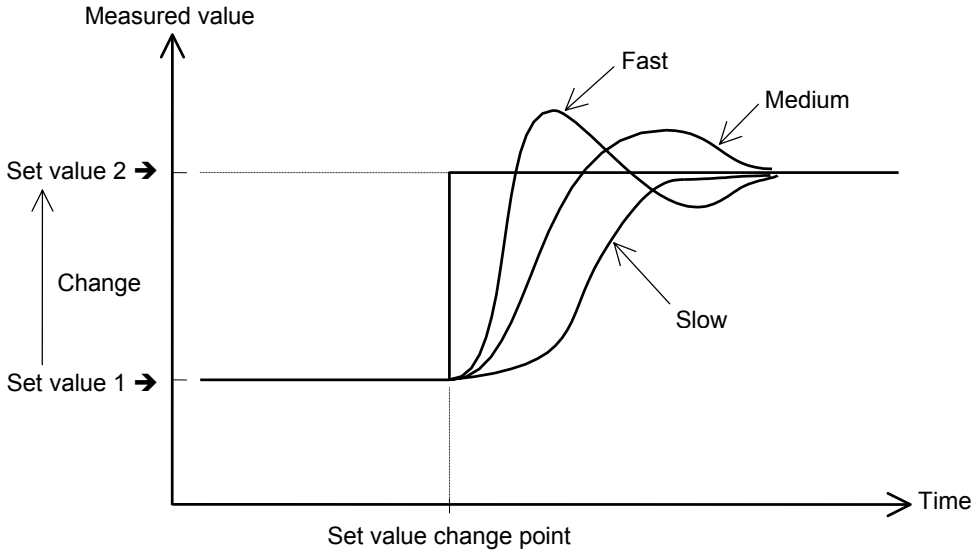
PID control is a control method of achieving stabilized control result by setting P (Proportional band), I (Integral time) and D (Derivative time) constants, and is widely used. However even in this PID control if P, I and D constants are set so as to be in good "response to setting," "response to disturbances" deteriorates. In contrast, if PID constants are set so as to be in good "response to disturbances," "response to setting" deteriorates. In brilliant PID control a form of "response to setting" can be selected from among **Fast**, **Medium** and **Slow** with PID constants remaining unchanged so as to be in good "response to disturbances."


Ordinary PID
P, I and D constants set so as to be in good response to set value change
Response to set value change
Response to disturbance change
Set value
Set value
P, I and D constants set so as to be in good response to disturbance
Response to set value change
Response to disturbance change
Set value
Set value



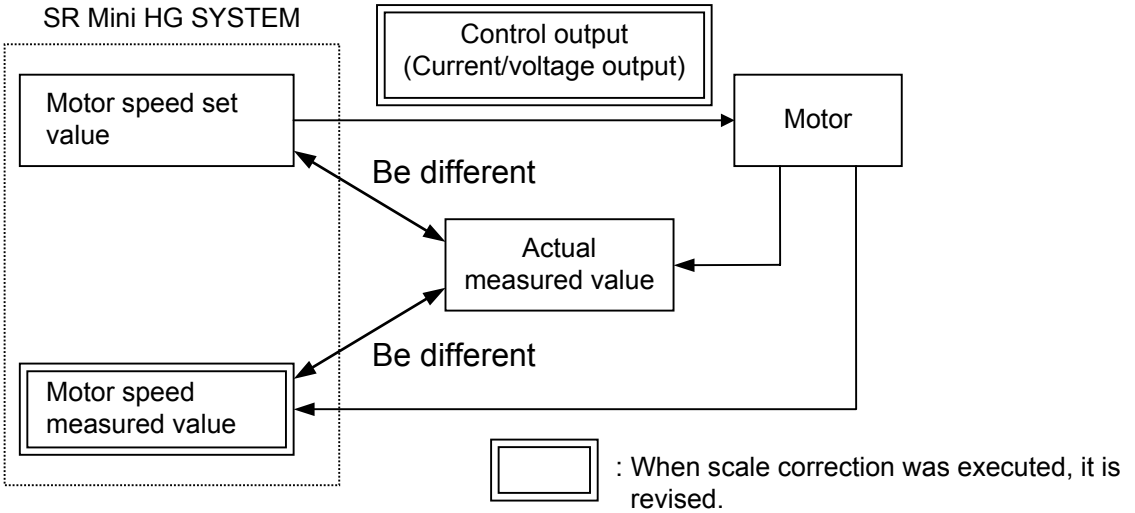
■ Control response parameters

This is the function of enabling the setting of response to set value change in select any one of 3 steps (**Slow**, **Medium**, **Fast**) in PID control.
In order to achieve faster controlled object response to set value change, select **Fast**. However, slight overshoot is unavoidable when selecting **Fast**. Depending on the controlled object, specify **Slow** if overshoot should be avoided.



8.2.6 Scale correction

This is the function of correcting the motor speed measured value and control output when the motor speed measured value differs from the actually measured value or motor speed set value differs from the actually measured value.



H-SIO-A correction trigger:

Sets whether correction is executed.

Setting rage: 0: Normal
1: Correction executed
2: Correction canceled (Return to motor speed measured value and control output value before correction.)

When the power is turned on, setting is 0.

H-SIO-A correction actual measured value:

Sets the actual measured value at scale correction.

Setting rage: Within display scale range

[Operation procedure]

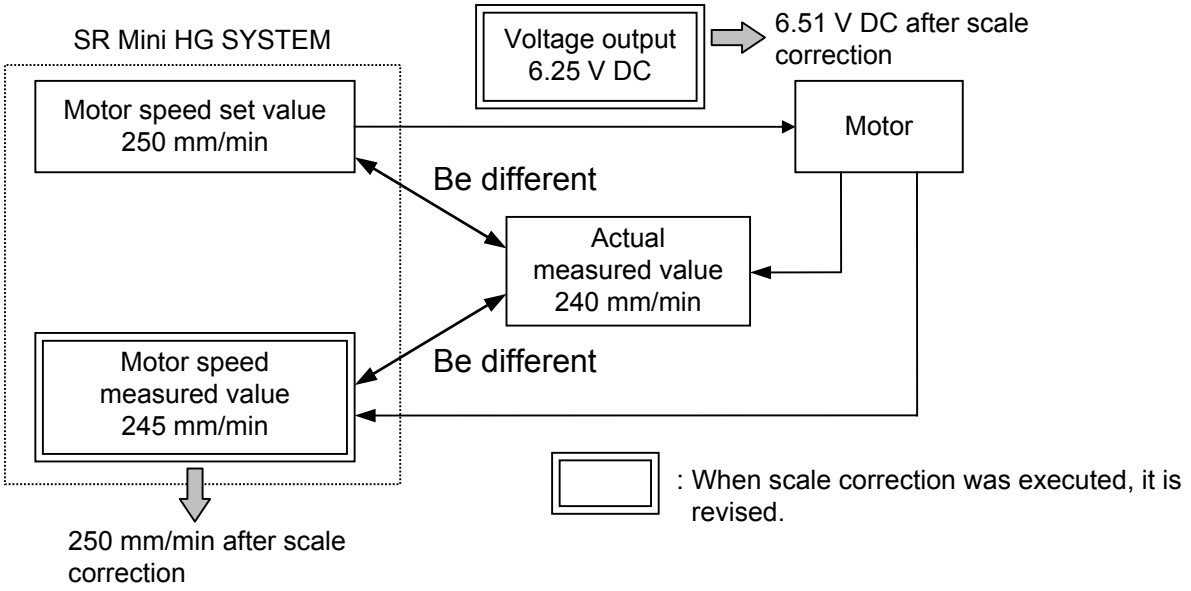
1. Sets the actual measured value to H-SIO-A correction actual measured value.

2. Sets the 1 to H-SIO-A correction trigger.
Scale correction is executed, and then control output and motor speed measured value are revised.

- When conducting the correction again, re-set the H-SIO-A correction actually measured value, and then set the H-SIO-A correction trigger to 1 after it is set to 0 once.
- The correction can be conducted in the open and closed loop control states. However, it is recommended that the correction be conducted in the open loop control state as the output becomes constant and stable under this state.
- Conduct the correction within the range of ±5 % . If the correction exceeding 5 % is required, adjust the display and output scales.
- Processing time of correction execution or cancel is about 1 second. Do not turn OFF the power during the processing time. In addition, maintain the setting more than 0.5 second in order to let it recognize modification in setting modification.

Example: Correction in the following value.

Control output:	Voltage output 0 to 10 V DC	Motor speed set value:	250 mm/min
Display scale high:	300 mm/min	Motor speed measured value:	245 mm/min
Display scale low:	0 mm/min	Actual measured value:	240 mm/min
Output scale high:	400 mm/min		
Output scale low:	0 mm/min		



- **Correction of output voltage**

$$\text{Output voltage} = \underset{\text{6.25 V DC}}{\text{Output voltage before correction}} \times \frac{\text{Motor speed set value (250 mm/min)}}{\text{Actual measured value at correction (240 mm/min)}} = 6.51 \text{ V DC}$$

Output voltage at motor speed set value 250 mm/min

$$6.25 \text{ V DC} = 250 \text{ mm/min} \times \frac{10 \text{ V DC}}{400 \text{ mm/min}}$$

Output voltage is corrected from 6.25 V DC to 6.51 V DC.

- **Correction of motor speed measured value**

$$\text{Motor speed measured value} = \underset{\text{(255 mm/min)}}{\text{Motor speed measured value before correction}} \times \frac{\text{Actual measured value at correction (240 mm/min)}}{\text{Motor speed measured value at correction (245 mm/min)}} = 250 \text{ mm/min}$$

Motor speed measured value at output voltage 6.51 V DC

$$255 \text{ mm/min} = 6.51 \text{ V DC} \times \frac{245 \text{ mm/min}}{6.25 \text{ V DC}}$$

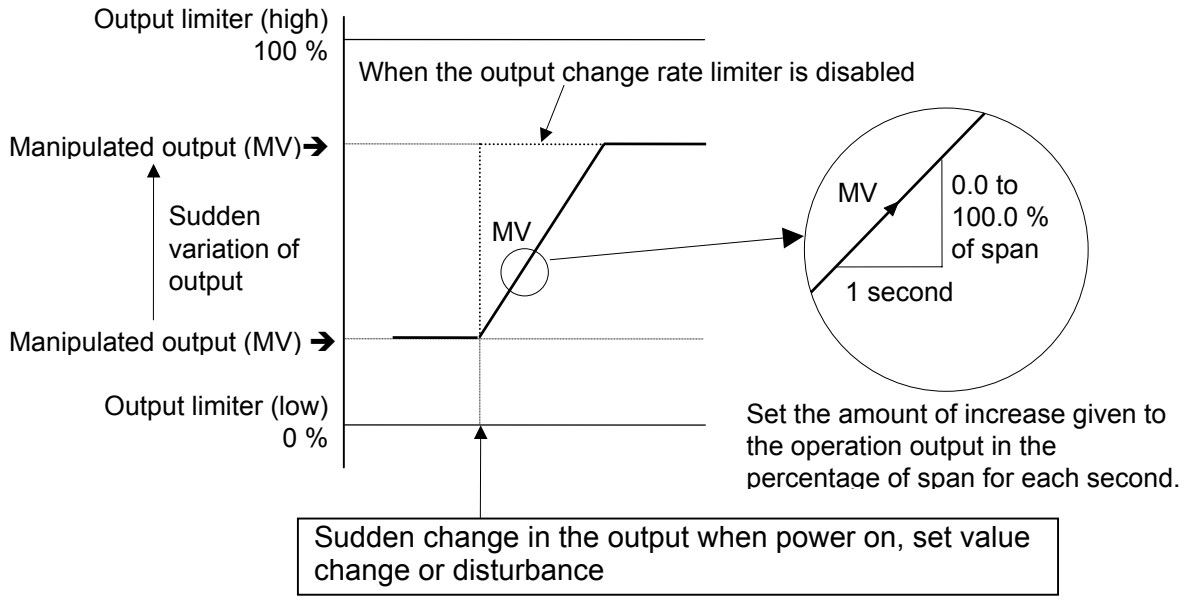
Motor speed measured value is corrected from 245 mm/min to 250 mm/min.

8.2.7 Output change rate limiter

The output change rate limiter limits the variation of manipulated output (MV) for a time unit. You can set an output variation, and control the output, when your object requires to avoid sudden variation. The output variation limiter is particularly effective when a sudden variation may cause the controller to crash, or when it may cause a large current. Also, it is very effective when you are dealing with current output or voltage output.

The output change rate limiter is effective in the following cases

- If the output starts from 100 % when putting power on (if a sudden change of 100 % causes a problem with variation of flow, etc.)
- If the output changes suddenly when changing the set value.


Output limiter (high)
100 %
When the output change rate limiter is disabled
Manipulated output (MV)➔
Sudden variation of output
MV
MV
0.0 to 100.0 % of span
1 second
Manipulated output (MV) ➔
Output limiter (low)
0 %
Set the amount of increase given to the operation output in the percentage of span for each second.
Sudden change in the output when power on, set value change or disturbance

As it is described in the figure above, the output does not make a sudden change, but it changes based on the set inclination, when giving power (outside of the proportional band), or changing the set value (large change).
The figure above is an example of upward output variation. For the downward variation, downward variation (inclination) has to be set.

- Response to the control becomes slow, and the effect of differentiation is lost, when the output change rate limiter is set too small (small inclination).
- The output change rate limiter is disabled, when it is set at 0.0.
- When the output change rate limiter is used, you may not be able to obtain appropriate PID constants during autotuning.

8.2.8 Alarm hold function

In the alarm hold function, the alarm function is kept invalid even if the motor speed measured value is in the alarm range when the power is on or the operation mode is switched to RUN from STOP. The alarm function is held until it passes with H-SIO-A alarm hold cancel time.

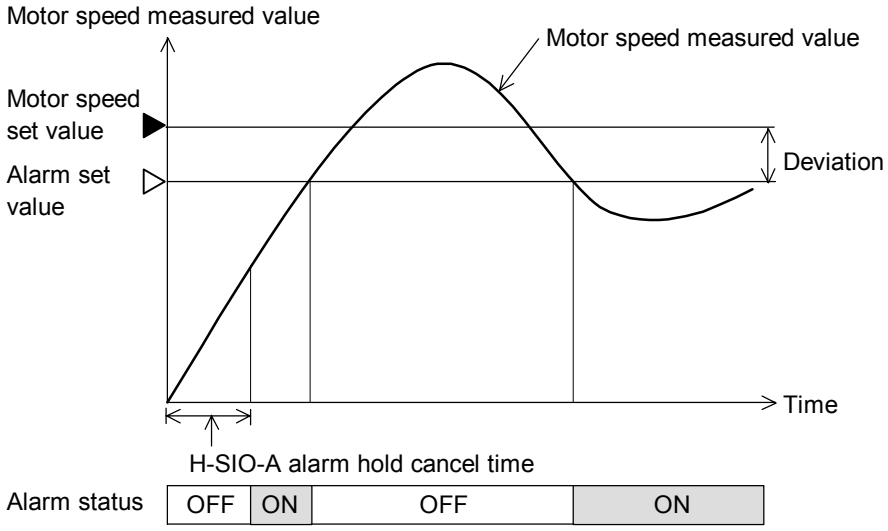
H-SIO-A alarm hold cancel time:

Set the time which cancels hold action of alarm.

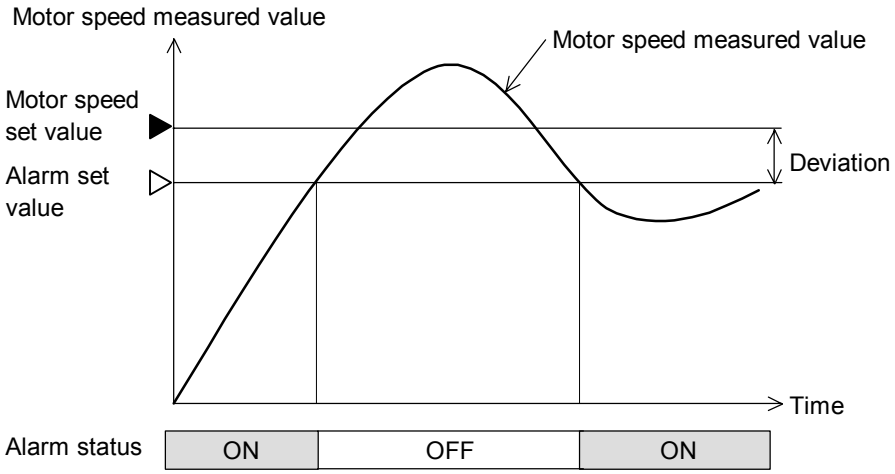
Setting range: 1 to 255 seconds

Example: The difference between alarms with “hold action” and without “hold action” are described by referring to the low limit deviation alarm as an example.

- **With alarm hold action**



- **Without alarm hold action**

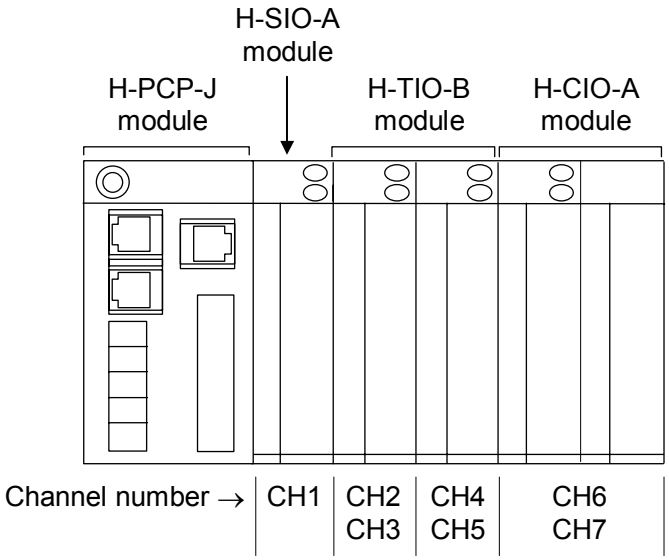


8.2.9 Assignment of channels

Channel number of H-SIO-A modules uses the same kind of channel number as H-TIO-□ modules and H-CIO-A modules. If the H-SIO-A modules are mounted together with H-TIO-□ modules and H-CIO-A modules, the channel numbers are continued. Channel number is decided in order automatically from the left.

Example: Examples of channel number assigning in the following system configuration.

H-PCP-J module ..... 1 H-TIO-B module 2
H-SIO-A module ..... 1 H-CIO-A module 1



9. TROUBLESHOOTING

This section lists some basic causes and solutions to be taken when any problem would arise in this instrument. If you can not solve a problem, please contact RKC sales office or the agent, on confirming the type name and specifications of the product.

If the instrument is necessary to be replaced, observe the following warning.

⚠ WARNING

- To prevent electric shock or instrument failure, always turn off the system power before replacing the instrument.
- To prevent electric shock or instrument failure, always turn off the power before mounting or removing the instrument.
- To prevent electric shock or instrument failure, do not turn on the power until all the wiring is completed.
- To prevent electric shock or instrument failure, do not touch the inside of the instrument.
- All wiring must be performed by authorized personnel with electrical experience in this type of work.

CAUTION

All wiring must be completed before power is turned on to prevent electric shock, instrument failure, or incorrect action.
The power must be turned off before repairing work for input break and output failure including replacement of sensor, contactor or SSR, and all wiring must be completed before power is turned on again.

When replacing the module with a new one, always use the module with the same model code. In addition, when replacing the module with a new one of the different module type, please contact RKC sales office or the agent as it becomes necessary to initialize the module, etc.

As all data on PID constants, alarm set values, etc. is managed by the H-PCP module, it is necessary to re-enter and re-set all data when the H-PCP module is replaced.
However, re-entry and re-set are not required in the following cases.

- **When data backup software is operating in the module by the external host computer.**
- **When it is set on the operation panel so that data on the operation panel side is transferred to the control unit side when the power is turned on again.**

■ H-PCP-J module

Problem	Probable cause	Solution
RUN lamp does not light up	Power not being supplied	Check external breaker etc.
	Appropriate power supply voltage not being supplied	Check the power supply
	Power supply terminal contact defect	Retighten the terminals
	Power supply section defect	Replace H-PCP-J module
RUN lamp stays lit	Module out of place	Install back in place
	The module was not initialized after the module configuration was changed	Execute **Module initialization** or return the configuration to its original specifications
RX1, RX2 (data reception) lamp does not flash TX1, TX2 (data transmission) lamp does not flash	Wrong connection, no connection or disconnection of the communication cable	Confirm the connection method or condition and connect correctly
	Breakage, wrong wiring, or imperfect contact of the communication cable	Confirm the wiring or connector and repair or replace the wrong one
	CPU section defect	Replace H-PCP-J module
DO is not output	Output allocation defect	Check the allocation settings
	Output circuit defect	Replace H-PCP-J module
FAIL is output	H-PCP module CPU section, power section defect	Replace H-PCP-J module
FAIL is output (but FAIL lamp not lit up) RUN lamp stays lit	The module was not initialized after the module configuration was changed	Execute **Module initialization** or return the configuration to its original specifications
	Module out of place	Install back in place

■ RKC communication

Problem	Probable cause	Solution
No response	Wrong connection, no connection or disconnection of the communication cable	Confirm the connection method or condition and connect correctly
	Breakage, wrong wiring, or imperfect contact of the communication cable	Confirm the wiring or connector and repair or replace the wrong one
	Mismatch of the setting data of communication speed and data bit configuration with those of the host	Confirm the settings and set them correctly
	Wrong address setting	
	Error in the data format	Reexamine the communication program
	Transmission line is not set to the receive state after data send (for RS-485)	
EOT return	The specified identifier is invalid	Confirm the identifier is correct or that with the correct function is specified. Otherwise correct it
	Error in the data format	Reexamine the communication program
NAK return	Error occurs on the line (parity bit error, framing error, etc.	Confirm the cause of error, and solve the problem appropriately. (Confirm the transmitting data, and resend data)
	BCC error	
	The data exceeds the setting range	Confirm the setting range and transmit correct data
	The block data length of the transmission exceeds 128 bytes	Divide the block using ETB before sending it
	The specified identifier is invalid	Confirm the identifier is correct or that with the correct function is specified. Otherwise correct it
	The transmission mode of the operation panel is set to local mode	Change to computer mode

■ Modbus

Problem	Probable cause	Solution
No response	Wrong connection , no connection or disconnection of the communication cable	Confirm the connection method or condition and connect correctly
	Breakage, wrong wiring, or imperfect contact of the communication cable	Confirm the wiring or connector and repair or replace the wrong one
	Mismatch of the setting data of communication speed and data bit configuration with those of the host	Confirm the settings and set them correctly
	Wrong address setting	
	A transmission error (overrun error, framing error, parity error or CRC-16 error) is found in the query message	Re-transmit after time-out occurs or verify communication program
	The time interval between adjacent data in the query message is 24-bit time or more and less than 24-bit time + 2 ms *	Set the Modbus mode selection (COM.PORT3 setting switch, No. 7) to ON (Modbus mode 2).
	The time interval between adjacent data in the query message is too long, 24-bit time + 2 ms or more	Re-transmit after time-out occurs or verify communication program
Error code 1	Function cod error (Specifying nonexistent function code)	Confirm the function code
Error code 2	When written to read only (RO) data, When any address other than 0000H to 1FFFH is specified, etc.	Confirm the address of holding register
Error code 3	When the data written exceeds the setting range, When the specified number of data items in the query message exceeds the maximum number of data items available	Confirm the setting data

* 24-bit time ≤ The time interval between adjacent data < 24-bit time + 2 ms

☞ For the Modbus mode selection setting, see the **5.1 Protocol Selection and Host Communication Setting (P. 43).**

■ PLC communication

Problem	Probable cause	Solution
TX1 (data transmission) lamp does not flash RX1 (data reception) lamp does not flash	Wrong connection, no connection or disconnection of the communication cable	Confirm the connection method or condition and connect correctly
	Breakage, wrong wiring, or imperfect contact of the communication cable	Confirm the wiring or connector and repair or replace the wrong one
	Mismatch of the setting data of communication speed, data bit configuration and protocol with those of the PLC	Confirm the H-PCP-J module settings and set them correctly
TX1 (data transmission) lamp flashes RX1 (data reception) lamp does not flash (is extinguished)	Wrong connection, no connection or disconnection of the communication cable	Confirm the connection method or condition and connect correctly
	Breakage, wrong wiring, or imperfect contact of the communication cable	Confirm the wiring or connector and repair or replace the wrong one
	Wrong setting of PLC communication data	Confirm the PLC communication settings and set them correctly
		Setting of termination resistor in accordance with PLC or the insertion is done
RX1 (data reception) lamp always light up	Wrong connection, no connection or disconnection of the communication cable	Confirm the connection method or condition and connect correctly
	Breakage, wrong wiring, or imperfect contact of the communication cable	Confirm the wiring or connector and repair or replace the wrong one

Continued on the next page.

Continued from the previous page.

Problem	Probable cause	Solution
TX1 (data transmission) lamp and RX1 (data reception) lamp are flashed alternately	Setting of PLC becomes write inhibit	Setting of PLC is turned into write enable (Write enable in RUN, shift to monitor mode, etc.)
	Accesses outside the range of memory address of PLC (wrong setting of address)	Confirm the H-PCP-J module settings and set them correctly (Set unit address to become in memory address range of PLC)
When request command is set in “1: Setting,” setting error (bit 8 of TIO status, ON) is become	Data rang error	Confirm the setting range of set value and set them correctly
Even if "1: Setting" or "2: Set value monitor" is set in request command, transfer is not finished. Request command does not return to "0: Monitor"	Because response of the PLC side is slow, H-PCP-J becomes time-out by being waiting for response from PLC.	Set PLC scanning time setting (H-PCP-J module identifier : ST) to any value more than twice as long as the maximum scanning time of PLC.
TX1 lamp, RD1 lamp flash on and off in turn, and it can be seen to communicate normally, but monitor value is not transferred to PLC.	Because response of the PLC side is slow, H-PCP-J becomes time-out by being waiting for response from PLC.	Set PLC scanning time setting (H-PCP-J module identifier : ST) to any value more than twice as long as the maximum scanning time of PLC.
If two or more units are connected, no units after the second unit are recognized.	Because response of the PLC side is slow, H-PCP-J becomes time-out by being waiting for response from PLC.	Set PLC scanning time setting (H-PCP-J module identifier : ST) to any value more than twice as long as the maximum scanning time of PLC.

☞ For the PLC scanning time setting (Identifier ST), see **P. 80 (RKC communication), P. 138 (Modbus communication)**.

10. ASCII 7-BIT CODE TABLE

This table is only for use with RKC communication.

					b7	0	0	0	0	1	1	1	1
					b6	0	0	1	1	0	0	1	1
					b5	0	1	0	1	0	1	0	1
b5 to b7	b4	b3	b2	b1		0	1	2	3	4	5	6	7
	0	0	0	0	0	NUL	DLE	SP	0	@	P	‘	p
	0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q
	0	0	1	0	2	STX	DC2	”	2	B	R	b	r
	0	0	1	1	3	ETX	DC3	#	3	C	S	c	s
	0	1	0	0	4	EOT	DC4	$	4	D	T	d	t
	0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
	0	1	1	0	6	ACK	SYM	&	6	F	V	f	v
	0	1	1	1	7	BEL	ETB	’	7	G	W	g	w
	1	0	0	0	8	BS	CAN	(	8	H	X	h	x
	1	0	0	1	9	HT	EM	)	9	I	Y	i	y
	1	0	1	0	A	LF	SUB	*	:	J	Z	j	z
	1	0	1	1	B	VT	ESC	+	;	K	[	k	{
	1	1	0	0	C	FF	FS	,	<	L	¥	l	|
	1	1	0	1	D	CR	GS	–	=	M	]	m	}
	1	1	1	0	E	SO	RS	.	>	N	^	n	~
	1	1	1	1	F	SI	US	/	?	O	_	o	DEL

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